

HEALTH LITERACY: THE CURRENT STATE OF PRACTICE
AMONG RESPIRATORY THERAPISTS

by

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A dissertation submitted to the faculty of
The University of North Carolina at Charlotte
in partial fulfillment of the requirements for
the degree of Doctor of Educational Leadership

Charlotte

2009

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ABSTRACT

KIMBERLY MAY CLARK. Health literacy: The current state of practice among respiratory therapists. (Under the direction of Dr. CLAUDIA FLOWERS)

Nearly half of American adults lack the necessary health literacy skills needed to understand and act appropriately on health information. The purpose of this research was to assess the current state of practice and knowledge of health literacy among licensed respiratory therapists currently working in North Carolina. A total of 335 respiratory therapists participated in this study. Health literacy knowledge and experience were measured using the Revised Health Literacy Knowledge and Experience Survey instrument. Knowledge gaps were most evident in basic facts on health literacy and health literacy screening. Study participants had limited health literacy experiences in activities related to the evaluation and presentation of health care information. Confirmatory factor analysis suggested a reasonably good fitting model to the health literacy experience data, Satorra-Bentler scaled χ^2 (28, $N = 324$) = 57.3, $p < 0.001$, RMSEA = 0.057, NFI = 0.97, CFI = 0.98, GFI = 0.96. In terms of the relationship between health literacy knowledge and experiences, regression analysis revealed a statistically significant but small relationship between health literacy knowledge and core health literacy experiences, $R^2 = 0.04$ ($N = 329$, $p = 0.01$). Basic facts on health literacy and guidelines for presenting patient information each had significant relationship with core health literacy experiences. The results suggest that the respiratory therapists in this study have gaps in health literacy knowledge and limited experience in assessing and implementing strategies to address low health literacy among their patients.

DEDICATION

I dedicate this work to my mother, Sandra Clark, and to my grandfather, Hobert Clark. The unconditional love, support, and encouragement they gave throughout my life serve as my motivation and inspiration for teaching and caring for others. Even though my mother is no longer with me, her memory and love for life will live on in my heart.

ACKNOWLEDGMENTS

The completion of this dissertation and the work leading up to it would not have been possible without the direction and support of the faculty at the University of North Carolina at Charlotte. I would like to acknowledge Dr. Claudia Flowers, my dissertation chair, for her advice and encouragement throughout the dissertation process. I thank my committee members, Dr. Grace Mitchell, Dr. Lisa Howley, and Dr. Susan Tsivitse for their willingness to work with me and for their time and feedback during this process. I greatly appreciate the commitment my committee put forth toward helping me complete this project.

I would thank my colleagues in the Department of Kinesiology at the University of North Carolina at Charlotte for their continued support and encouragement throughout my doctoral studies. I would also like to thank my friends and colleagues in the respiratory therapy profession. Without their help, this research study would not have been possible.

I would like to especially extend a thank you to my friends and family for believing in me even when I doubted myself. Their support, encouragement, and patience throughout my doctoral studies were a blessing.

TABLE OF CONTENTS

LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xi
CHAPTER 1: INTRODUCTION	1
CHAPTER 2: LITERATURE REVIEW	10
2.1 A Call to Action for Health Literacy	13
2.2 Health Literacy and Health Disparities	16
2.2.1 Prevalence of Inadequate Health Literacy	16
2.2.2 Consequences of Inadequate Health Literacy	18
2.3 Measuring Health Literacy	42
2.3.1 The REALM & REALM-R	43
2.3.2 The S-TOFHLA	44
2.3.3 The NVS	45
2.3.4 Additional Methods of Identifying Low Health Literacy	46
2.4 Patient Education Strategies	49
2.4.1 Adult Learning Considerations	49
2.4.2 Designing Effective Patient Education Materials	52
2.4.3 Patient Education Delivery Methods	56
2.4.4 Professional Education and Development in Health Literacy	59
2.5 Summary and Planned Research	60

TABLE OF CONTENTS (continued)

CHAPTER 3: METHODS	62
3.1 Participants and Setting	63
3.1.1 Participants & Sample Selection	63
3.1.2 Setting	63
3.2 Instrumentation	64
3.2.1 Health Literacy Knowledge & Experience Survey Instrument	65
3.3 Procedures	68
3.3.1 Data Collection	68
3.3.2 Data Analyses	69
3.3.3 Anticipated Ethical Issues	73
3.4 Summary	74
CHAPTER 4: RESULTS	75
4.1 Revised HL-KES Reliability and Validity Evidence	75
4.2 Participant Demographic Information	83
4.3 Health Literacy Knowledge	84
4.4 Health Literacy Experiences	95
4.5 Relationship Between Health Literacy Knowledge & Experience	98
4.6 Summary	101
CHAPTER 5: SUMMARY & DISCUSSION	103
5.1 Study Purpose	104
5.2 Procedures	104
5.3 Summary & Discussion of Findings	106

TABLE OF CONTENTS (continued)

5.3.1 Revised HL-KES Reliability and Validity	106
5.3.2 Participant Demographic Information	107
5.3.2 Health Literacy Knowledge	108
5.3.3 Health Literacy Experiences	109
5.3.4 Relationship Between Health Literacy Knowledge & Experience	113
5.4 Limitations	114
5.5 Implications & Recommendations	114
REFERENCES	117
APPENDIX A: NCRCB PERMISSION LETTER	128
APPENDIX B: HL-KES PERMISSION CORRESPONDENCE	129
APPENDIX C: REVISED HL-KES INSTRUMENT	130
APPENDIX D: ORIGINAL HL-KES INSTRUMENT	139
APPENDIX E: IRB APPROVAL DOCUMENTATION	146
APPENDIX F: SURVEY INVITATION EMAIL	147
APPENDIX G: INFORMED CONSENT	148
APPENDIX H: SELECTED HEALTH LITERACY RESOURCES AND EDUCATIONAL PROGRAMS	149

LIST OF TABLES

TABLE 1: Selected Published Studies on the Consequences of Low Health Literacy	35
TABLE 2: Health Literacy Assessment Instruments	47
TABLE 3: Readability Instruments for Assessing Written Healthcare Materials	55
TABLE 4: Item Analysis for Correct Responses to Items in Part I of the Revised HL-KES	76
TABLE 5: Correlations, Means, and Standard Deviations for Health Literacy Experience Variables	80
TABLE 6: Frequencies and Percentages for Participant Demographic Characteristics (N = 335)	83
TABLE 7: Sample Size and Percentages of Correct and Incorrect Responses to Items in Part I of the Revised HL-KES Five Content Areas	89
TABLE 8: Overall Percent of Correct Responses for the Revised Health Literacy Knowledge Five Content Areas	95
TABLE 9: Percentages and Sample Size for Responses to Items in Part II of the Revised HL-KES within the Core and Technical Health Literacy Experiences Sub-Constructs	96
TABLE 10: Correlations, Means, and Standard Deviations for the Revised HL-KES Study Variables	99
TABLE 11: Multiple Regression Analysis Summary for Health Literacy Experiences	100

LIST OF FIGURES

FIGURE 1: Conceptual hypothesized model of health literacy experiences	71
FIGURE 2: Standardized coefficients for the final modified measurement model	82
FIGURE 3: Histogram illustrating the distribution of participant percent scores for health literacy knowledge with a norm curve superimposed	85
FIGURE 4: Health literacy knowledge and experience regression model	101

LIST OF ABBREVIATIONS

AARC:	American Association for Respiratory Care
AMA:	American Medical Association
COPD:	Chronic Obstructive Pulmonary Disease
HL-KES:	Health Literacy Knowledge and Experience Survey
IOM:	Institute of Medicine
MDI:	Metered-Dose Inhaler
NAALS:	National Assessment of Adult Literacy
NALS:	National Adult Literacy Survey
NVS:	Newest Vital Sign
REALM:	Rapid Estimate of Adult Literacy in Medicine
S-TOFHLA:	Short Test of Functional Health Literacy in Adults
TOFHLA:	Test of Functional Health Literacy in Adults

CHAPTER 1: INTRODUCTION

Low health literacy affects over 90 million American adults. In 1992, the National Adult Literacy Survey (NALS) reported that more than 40 million adult Americans (21%) were functionally illiterate and an additional 50 million (26%) had marginal literacy skills (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993). These results suggest that adults with inadequate and marginal literacy levels would experience difficulty functioning within the health care system. Individuals' ability to manage health and use the healthcare system is associated with their health literacy skills (Cutilli, 2005). What is health literacy? The term health literacy has evolved since its first appearance in the literature over 30 years ago, which was described as a goal of health education curriculum in the school education system (Ratzan & Parker, 2000).

The simplest definition of health literacy is defined as "the ability to read and understand written materials commonly encountered in the healthcare setting" (Scott, Gazmararian, Williams, & Baker, 2002, p. 395). The most complete, but not widely used, is offered by the World Health Organization (WHO): "Health literacy represents the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health" (Nutbeam, 2000, p. 264). This definition moves beyond simply understanding basic information by describing it as the ability to extract and critically analyze information and apply that information to changing situation effectively (Nutbeam,

2000). For the purposes of this study, the most commonly accepted definition of health literacy is defined as “the ability to obtain, interpret, and understand basic health information and services needed to make appropriate health decisions” (Ratzan & Parker, Introduction, 2000, p. vi). This definition implies that individuals with adequate health literacy can make appropriate health decisions for positive health outcomes.

Low health literacy affects everyone regardless of race, ethnicity, age, education, or socioeconomic status. The average reading level of many American adults is at or below the ninth grade level; and for older adults aged 65 years and older and urban minorities, nearly two out of five read at or below the fifth grade level (Doak, Doak, & Root, 1996). Poor overall health literacy rates, coupled with the fact that much of the available health related information is written at levels higher than what the average American adult can read and understand (Safeer & Keenan, 2005), further contribute to the challenges associated with low health literacy and increases the risk of poor health outcomes.

Determining an individual’s health literacy level is complicated because many American adults read and understand information at least three to five grade levels below the last completed grade level of formal education (Doak et al., 1996) and skills learned in formal education diminish if they are not used regularly (Cutilli, 2005). In addition, researchers indicate that individuals with poor literacy skills reported that they read “well or very well” (Doak et al., 1996) making low health literacy difficult to identify. Individuals with low literacy levels may deny or hide their inability to read because of the feeling of shame or inadequacy (Kickbusch, 2001). Shame may cause patients to feel intimidated, thus making them less likely to ask questions or tell their healthcare provider

that they do not understand the information (Baker et al., 1996). Furthermore, the majority of individuals with low health literacy skills never told their spouses they could not read (Parikh, Parker, Nurss, Baker, & Williams, 1996).

Healthcare providers may make assumptions about their patients' ability to understand health information based on educational attainment or socioeconomic status; however, even well educated individuals may have difficulty understanding health information that contains unfamiliar medical or technical jargon (Barrett & Puryear, 2006). Healthcare providers rely on written materials to supplement and even introduce health related information to their patients. However, patients with low literacy often rely on oral explanations of medical information and instructions and report difficulty in understanding those explanations given by their healthcare provider (Baker et al., 1996). Researchers reported that healthcare providers frequently used medical jargon during patient encounters (Castro, Wilson, Wang, & Schillinger, 2007), but use of medical jargon can create communication barriers between patients and their healthcare providers.

The Acting Surgeon General of the United States, Dr. Kenneth Moritsugu, held a Surgeon General's Workshop on Improving Health Literacy in September 2006. The proceedings emphasized the following: 1) healthcare providers must provide clear and understandable information in order to achieve healthier behaviors; 2) health literacy must be addressed before medical research, health information technology, and advances in healthcare delivery can progress forward; 3) health literacy is a systematic problem to be addressed in the context of larger systems; and 4) that more health literacy research is needed (Proceedings of the Surgeon General's Workshop on Improving Health Literacy, 2006). In the Keynote address at the December 2006 International AARC congress, Dr.

Moritsugu stressed the importance of health literacy to more than 4000 respiratory therapists and indicated that respiratory therapists were an integral part in addressing health prevention, public health preparedness, and eliminating health disparities (Storer, 2006).

Study Purpose

The purpose of the research was to assess the current state of practice and knowledge of health literacy among licensed respiratory therapists who are currently working in North Carolina. In addition, the researcher sought to determine if a relationship exists between health literacy knowledge and experience. The study investigated the following questions:

1. What do respiratory therapists understand in regards to health literacy?
2. What is the current state of practice of respiratory therapists in addressing inadequate health literacy?
3. Is there a relationship between the current state of practice and health literacy knowledge of respiratory therapists?

Limitations

There are two factors that may limit the scope of this research study. First, the survey research study took place in North Carolina and was limited to licensed respiratory therapists with available email addresses currently working in a health care setting, which may limit the ability to generalize results to the larger respiratory therapy population outside of this study. Second, this study used a convenience sample and is subject to the limitations of self-selection and bias. The lack of random selection may limit the ability to generalize the results.

Significance

Healthcare professionals, including respiratory therapists, do not systematically assess their patients' literacy skills, which may be due to a lack of awareness, knowledge, and training in this area or available time. Also, healthcare professionals are highly educated with adequate health literacy, but it does not mean that they can explain medical information in a way that patients can understand.

The medical literature provides overwhelming supporting evidence of the prevalence and consequences of low health literacy that leads to adverse health outcomes (DeWalt, Berkman, Sheridan, Lohr, & Pignone, 2004; Paasche-Orlow, Parker, Gazmararian, Nielson-Bohlman, & Rudd, 2004). For example, researchers reported that low health literacy was associated with higher hospitalization rates for asthma, less asthma knowledge, and improper MDI technique (Paasche-Orlow et al., 2005). However, there is little research on health literacy in the respiratory therapy literature.

Since the literature on health literacy primarily targets physicians, nurses, and pharmacists, the 2003 Coalition for Allied Health Leadership (CAHL) Health Literacy Project team conducted a survey of allied health professionals and educators to assess the current health literacy awareness and needs concerning inadequate health literacy (Brown et al., 2004). Of the 36 participants, one third reported being unaware of the issues regarding health literacy or the consequences associated with inadequate health literacy on patient care. In addition, less than one fourth of the participants were aware of available health literacy resources for improving patient communication. The CAHL Health Literacy Project team recommended large-scale surveys of health literacy

practices and needs and to develop accessible resources specific to the allied health professions, which includes respiratory therapy.

The North Carolina Literacy Resource Center provided synthetic estimates of adult literacy at the county level and selected cities and towns (Siedow, 1998). An estimated 22% of adults in North Carolina had inadequate health literacy and another 30% had marginal health literacy. The heaviest concentration of inadequate health literacy was found in the counties of Northeast region of the state including Bertie (42%), Northampton (42%), Warren (41%), Halifax (38%), and Hertford (38%). According to the North Carolina Institute of Medicine (NC IOM), these state level estimates rank North Carolina 41st of all states in basic or below basic literacy levels (NC IOM, 2007). The NC IOM stated, “North Carolina health care professionals...should work together to address the problems of health literacy (NC IOM, 2007, p.2).

Respiratory therapists are vital members of the health care team providing medical treatment, support, and education to patients and family members. Respiratory therapists are formally trained to provide patient education for cardiovascular diseases (e.g. hypertension) and pulmonary conditions (e.g. chronic obstructive pulmonary diseases [COPD] and asthma) including proper medication use and lifestyle modifications such as diet, exercise, and disease monitoring techniques in a variety of settings.

There are no known studies assessing the knowledge and experience of respiratory therapists in addressing issues surrounding inadequate health literacy. The researcher intends to delineate the health literacy knowledge of respiratory therapists and their experiences in addressing patients with low health literacy. This study will be

significant on both the state and national level. On the state level, since more than half of the adults in North Carolina have inadequate and marginal health literacy, it is the intent of the researcher that this study will serve to define the concept of health literacy as well as its prevalence and negative impact on patient health outcomes so that the results may aid in developing better educational programs to increase awareness and provide strategies for addressing patients with inadequate health literacy. In addition, the results of this study may contribute new knowledge to the respiratory therapy body of literature on health literacy and potentially serve as a point of reference for future health literacy studies in the respiratory therapy profession.

In the following sections, the literature review will examine the current and relevant research studies and other important information regarding the impact of health literacy, how to measure health literacy, and strategies to lessen the impact of inadequate health literacy. The methods section will describe the participants, instrumentation, procedures, data analyses, and potential ethical concerns. The results section presents a description of the findings and analysis of the data in terms of the research questions. The summary and discussion section contains a summary of the study and discussion of the findings along with limitations and implications and recommendations for further research.

Definitions of Terms

For the purposes of this study, the following terms were defined:

Chronic Condition: A medical condition lasting three consecutive months or longer

(Schwartzberg, VanGeest, & Wang, 2005).

Health Behavior: Any individual activity intended to promote, protect, or maintain health (Nutbeam, 1998).

Health Communication: “The art and technique of informing, influencing, and motivating individual, institutional, or public audiences about important health issues” (Schwartzberg et al., 2005, p.232).

Health Disparities: “...differences in the incidence, prevalence, mortality, and burden of diseases and other adverse health conditions that exist among specific population groups in the United States” (NIH, 2000 as cited in Carter-Pokras & Baquet, 2002, p.246).

Health Education: Is intentional guided opportunities for learning involving some form of communication designed to improve health literacy, including the increase of knowledge and development of life skills aimed at individual and community health (Nutbeam, 1998).

Health Literacy: “The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” (Ratzan & Parker, Introduction, 2000, p. vi).

Health Outcomes: “A change in the health status of an individual, group or population that is attributable to a planned intervention, or series of interventions, regardless of whether such an intervention was intended to change health status” (Nutbeam, 1998, p.357).

Health Policy: “A formal statement or procedure within institutions (notably government) which defines priorities and the parameters for action in response to health needs, available resources and other political pressures” (Nutbeam, 1998, p.357).

Quality of Life: “The perception of individuals that their needs are being satisfied and that they are not being denied opportunities to achieve happiness and fulfillment, regardless of physical health status, or social and economic conditions” (Nutbeam, 1998, p.361).

Risk Behavior: Any individual behavior proven to be associated with contributing to a specific disease or illness (Nutbeam, 1998).

Abbreviations

AARC:	American Association for Respiratory Care
AMA:	American Medical Association
COPD:	Chronic Obstructive Pulmonary Disease
HL-KES:	Health Literacy Knowledge and Experience Survey
IOM:	Institute of Medicine
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CHAPTER 2: LITERATURE REVIEW

Low health literacy is a silent epidemic that impairs the ability of patients to properly access, understand, and use essential health care related information and services, which poses a significant barrier to care. Low health literacy does not discriminate; it affects everyone regardless of age, race, socioeconomic status, or educational attainment. However, those patients who are at the greatest risk from the consequences associated with low health literacy include vulnerable populations, such as the elderly and minorities. For example, nearly two out of five elderly adults (65 years of age and older) and urban minorities read at or below the fifth grade level (Doak et al, 1996).

The current health care environment is a vast and complex system in a constant state of change. Technology that is considered “state-of-the-art” today becomes quickly outdated with the new advances. Research studies are published every day that report new treatment advances and medications making it difficult at best for health care providers to stay current with all of these changes. As both healthcare technology and medical treatments advance, patients need effective health literacy skills to understand the complex information to make appropriate informed decisions regarding their health. Additionally, patients are expected to know when and how to access healthcare services in order to receive quality care.

Patients must be able to ask the right questions, properly take medications, monitor their health, and modify their lifestyle to properly manage their chronic diseases at home; and they rely on health care providers to provide this essential information. Unfortunately, as healthcare providers, we fail to adequately and consistently provide patients with the necessary information in a way they can understand by often overlooking basic needs such as the ability to read and understand healthcare information.

The sheer volume of available healthcare materials available can overwhelm and challenge even those individuals who read and process information adequately. More importantly, individuals with poor health literacy skills may not be able to understand complex information or negotiate the healthcare system; therefore, they may make decisions that could adversely affect their health outcomes. In 1992, the National Adult Literacy Survey (NALS) results indicated that approximately 90 million American adults did not have adequate literacy skills (Kirsh et al., 1993). Furthermore, the National Assessment of Adult Literacy Survey (NAALS), conducted in 2003, did not indicate much improvement in the overall state of literacy in the United States (Kutner, Greenburg, Jin, & Paulsen, 2006). Poor overall literacy rates, coupled with the fact that much of the available health related information available is written at levels higher than what the average American adult can read and understand (Safeer & Keenan, 2005), further contribute to the challenges associated with low health literacy and increases the risk of poor health outcomes.

Health care providers rely on written materials to supplement and even introduce health related information to their patients. For example, on average patients only get a limited amount of time with their physicians during office visits. That time may include a

brief exam and a few minutes for questions and instructions regarding medications, decisions about diagnostic and screening tests, discussion about lifestyle modifications, and the need to schedule follow-up appointments. Braddock, Fihn, Levinson, Jonsen, and Pearlman (1997) conducted a qualitative study using archived audiotape recordings of primary care physician interactions with their patients to assess the process of informed consent leading to clinical decisions including discussion of the nature of the decision, alternatives, the risks and benefits, uncertainties, preferences, and assessment of patient understanding. None of the encounters included all the elements of informed consent. Fifty-one percent of the visits included at least one of informed consent elements while 15% included none of these elements. Physicians in this study discussed risks and benefits with their patients only 9% of the time and assessed patient understanding in only 2% of the visits. However, physicians who assess recall and comprehension of medical information and advice improve patient health outcomes (Schillinger et al., 2003).

Resident physicians care for patients under the direction of the attending physician as part of their medical training. Bass, Wilson, Charles, and Barnett (2002) found that resident physicians underestimated 36% of patients who had low health literacy levels; and Powell and Kripalani (2005) reported that only 14% of resident physicians and medical students considered inadequate health literacy as a contributing factor to patient nonadherence and hospital readmission. Patients are often sent home with pamphlets, brochures, or information packets to fill in the gaps of important information not covered during routine visits and hospital admissions. Unfortunately, this is where the gap often exists between the patient and health care provider. Patients with

low health literacy may not know how to ask the right health-related questions, as they are unable to adequately read and understand the written information provided by the healthcare professional.

A Call to Action for Health Literacy

Low health literacy is an emerging complex public health issue that has serious implications in how individuals seek and receive quality healthcare services. The problem is even more complicated by a lack of clarity about who is actually responsible for the health literacy problem. Some might argue the responsibility belongs to healthcare professionals; others might contest that it is the responsibility of the education system (Greenberg, 2001). It is possible the responsibility lies with both, meaning that healthcare professionals should focus on specific health issues and the educational system should focus on general health issues. Key stakeholders have released statements and recommendations on health literacy for healthcare professionals and policymakers including the American Medical Association (AMA), Institute of Medicine (IOM), and Joint Commission.

In 1999, the Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs of the AMA provided several reasons why health policymakers have been slow to respond to low health literacy issues that include 1) healthcare professionals are likely to assume that their patients can read, 2) low health literacy skills are viewed as an issue for the educational system, and 3) there is no group of consumers calling attention to the problem (AMA, 1999). In addition, the Ad Hoc Committee identified five reasons why health policymakers need to consider the ramifications associated with low health literacy that include 1) patients with low health literacy are less likely to be informed consumers

of health care services; 2) patients with low health literacy may be less likely to receive quality healthcare services; 3) healthcare provider legal liability is emerging over adverse health outcomes related to low health literacy; 4) there is an increased financial burden on the healthcare system, health insurance providers, and the patients; and 5) health disparities associated with low health literacy are more common in vulnerable populations such as the elderly and minorities.

The AMA adopted into policy recommendations that places emphasis on the reducing barriers to healthcare services for patients with low health literacy, increasing awareness of the prevalence and consequences of low health literacy, improving patient-provider communication, improving methods of identifying low health literacy, and allocating federal and private funds for health literacy research (AMA, 1999).

Understanding the need to provide a comprehensive resource of health literacy research findings to guide health care professionals and policymakers, the AMA released *Understanding Health Literacy: Implications for Medicine and Public Health* in 2005.

The IOM Committee on Identifying Priority Areas for Quality Improvement released the report *Priority Areas for National Action: Transforming Health Care Quality*. Health Literacy was identified as one of two cross-cutting factors that affect health care quality and disease management (Adams & Corrigan, 2003). One year later, the IOM Committee on Health Literacy published the report *Health Literacy: A Prescription to End the Confusion*. The committee stated that “health literacy is fundamental to quality care” (Nielson-Bohlman, Panzer, & Kindig, 2004, p.12), and is connected to three of the six specific aims of quality improvement that include safety, patient-centered care, and equitable treatment as outlined in the 2001 IOM report,

Crossing the Quality Chasm: A New Health System for the 21st Century. Furthermore, the committee stated, “health professionals...have limited education, training, continuing education, and practice opportunities to develop skills for improving health literacy” (Nielson-Bohlman et al. 2004, p.11). They recommended that health literacy education for health care professionals be included in formal and continuing education. In addition, the committee recommended that healthcare professional associations (e.g. American Association for Respiratory Care [AARC]) take an interest in promoting health literacy awareness.

The Joint Commission called for action by healthcare organizations and policymakers by linking health literacy to communication issues as a part of the accreditation standards for the National Patient Safety Goals. The Joint Commission (2007) stated that:

Health literacy issues which go unrecognized and unaddressed undermine the ability of health care organizations to comply with accreditation standards and safety goals meant to protect the safety of patients. The safety of patients cannot be assured without mitigating the negative effects of low health literacy and ineffective communications on patient care. (p.5)

The Joint Commission recommended that healthcare organizations raise awareness of the impact of low health literacy and provide healthcare professionals education to help recognize and address health literacy needs. Furthermore, the Joint Commission called for broader reimbursement policies covering more chronic disease patient education programs and offer incentives to organizations that promote patient-provider communication educational programs.

It is crucial that the barrier created between patients with low health literacy and the healthcare community be eliminated in order to provide critical health information to improve health outcomes. Research indicates that inadequate health literacy skills are a stronger predictor of an individual's health outcome than age, income status, employment status, educational attainment, and racial or ethnic group (Partnership for Clear Health Communication [PFCHC], n.d.).

Health Literacy and Health Disparities

Low health literacy is considered to be a significant problem among older adults, and the impending explosive growth in this age group could possibly cripple an already struggling healthcare system. Since older adults have the highest rates of chronic disease and health related complications, they have the greatest need to understand health related information (Williams et al, 1995). It is estimated that tens of billions of dollars are spent each year due to inadequate health literacy (Pfizer, 2003). Healthcare professionals should not take for granted or assume all patients have adequate health literacy, which leads to the under-estimation of the health disparities associated with the prevalence and consequences of inadequate health literacy.

Prevalence of Inadequate Health Literacy

Low literacy issues received national attention with the release of the NALS report in 1993, but it did not directly address health literacy. In the follow-up study, the 2003 NAALS contained 28 health literacy tasks that focused on three domains of health and health care information and services that included clinical, prevention, and navigation of the healthcare system (Kutner et al, 2006). The results of the NAALS revealed that an estimated 36% of American adults have low health literacy.

Additionally, the population groups having the highest rates of low health literacy were Hispanics (66%), adults aged 65 years and older (59%), African Americans (58%) and American Indian/Alaskan Native (48%) (Kutner et al, 2006).

In a groundbreaking study, Williams et al. (1995) reported that 22% to 62% of the patients had inadequate or marginal health literacy when compared to the NALS results, which reported that 46% to 51% of American adults had inadequate or marginal literacy skills (Kirsh et al., 1993). Approximately 33% of patients did not understand basic radiographic procedure instructions written at the fourth grade level, and even more alarming was that 24% to 58% of the patients did not understand the instructions for taking their medications (Williams et al., 1995). In another study of 483 patients with asthma, two thirds of the participants reported completing high school but only 27% read at the high school level; 33% read at the seventh to eighth grade level; 27% read at the fourth to sixth grade level; and 13% read at or below the third grade level (Williams, Baker, Honig, Lee, & Nowlan, 1998). Paasche-Orlow and colleagues (2004) conducted a systematic review that included 85 U.S. studies with data on 31,129 participants to examine the prevalence of limited health literacy. They reported that 26% of the participants had inadequate health literacy and an additional 20% had marginal health literacy. Even though these numbers are staggering, the prevalence of low health literacy is equally alarming among the elderly.

Older adults have a much higher incidence of low health literacy than any other age group (Roman, 2004). Williams et al. (1995) found that approximately 48% to 80% of adults aged 60 years and older had inadequate or marginal health literacy. These patients could not read basic health instructions such as prescription labels and

appointment slips. In 1999, a study of Medicare enrollees found that approximately 34% to 54% of adults aged 65 years and older had inadequate or marginal health literacy (Gazmararian et al., 1999). A possible explanation for the high rate of low health literacy among older adults may be associated with fewer years of schooling completed when compared to younger age groups (Kirsch et al., 1993). Furthermore, age related cognitive impairment and decreased visual acuity may contribute to the high rate of low health literacy among older adults (Baker, Gazmararian, Sudano, & Patterson, 2000).

Individuals with low health literacy do not fully comprehend medical information; therefore, they have less self disease-management skills, which may pose a significant threat to their overall health (Williams, Baker, Parker, & Nurss, 1998).

Consequences of Inadequate Health Literacy

The consequences associated with inadequate health literacy are far reaching and place patients at a tremendous disadvantage in caring for their health. Individuals with inadequate health literacy have difficulty navigating the health care system including finding the hospital and departments located within the hospital and completing medical forms (Baker et al., 1996), understanding medication instructions and reading appointment slips (Baker et al., 1996; Williams et al., 1995), less use of health screening and preventive services, higher hospitalization rates, higher costs, and experience overall poorer health outcomes (DeWalt et al., 2004). The following information will describe in further detail several studies that provide evidence of the consequences associated with inadequate health literacy. Table 1 provides a brief description of selected key supporting studies presented.

Healthcare utilization and mortality. Baker, Parker, Williams, and Clark (1998) conducted a study in a large, urban hospital by recruiting a convenience sample of 979 patients presenting in the emergency department with non-emergent conditions to determine the association between health literacy and risk of hospital admission between 1994 and 1995. Participants were administered the Test of Functional Health Literacy in Adults (TOFHLA) to measure health literacy levels, which identified 48% of the participants with inadequate and marginal health literacy. During the study period, 21% of the participants were admitted to the hospital at least once while 8% were admitted to the hospital two or more times. Hospitalization of one or more times was significantly higher for participants with inadequate health literacy (31.5%) when compared to participants with marginal (16.4%) and adequate (14.9%) health literacy. Furthermore, hospitalizations of two or more times were significantly higher for participants with inadequate health literacy (13.5%) when compared to participants with marginal (5.7%) and adequate (4.6%) health literacy. After adjusting for demographics, socioeconomic status, self-reported health, and health insurance coverage in a logistic regression model, participants with inadequate health literacy were 1.7 times more likely to be hospitalized when compared to participants with adequate health literacy. The researchers also indicated that participants with inadequate health literacy with one or more hospitalizations prior to the study were 3 times more likely to be hospitalized than participants with adequate health literacy.

In a larger study of 2,659 patients presenting at two urban hospitals, Baker, Parker, Williams, Clark, and Nurss (1997) focused on the relationship of health literacy to self-reported health and use of health services. The TOFHLA was used to measure

health literacy and identified that approximately 36% of participants had inadequate and 14% had marginal health literacy. After adjusting for demographics and socioeconomic indicators using logistic regression, the researchers reported that participants with inadequate health literacy were more likely to report poor health and report being hospitalized in the year prior to the study when compared to participants with adequate health literacy. After adjusting for demographics, socioeconomic indicators, and health literacy, they found that patient's years of schooling was not associated with poor health suggesting that years of school completed may not be a good assessment for determining reading ability.

Baker et al. (2002) used a convenience sample of 3,260 Medicare recipients enrolled in a national managed care organization in four urban areas between June and December 1997 to determine if inadequate health literacy is a risk of hospital admission. Health literacy was measured using the Short form of the Test of Functional Health Literacy in Adults (S-TOFHLA), which identified 34% English-speaking and 54% Spanish-speaking participants with inadequate and marginal health literacy (Gazmararian et al., 1999). With an overall 30% hospitalization rate of at least once during the study period, hospitalization rates were significantly higher for participants with inadequate (35%) and marginal (34%) health literacy when compared to those with adequate (27%) health literacy. In addition, hospital admissions of two or more times were significantly higher for participants with inadequate (20%) and marginal (18%) health literacy when compared to those with adequate (14%) health literacy (Baker et al. 2002). After adjusting for socio-demographics, education, income, health behaviors, chronic diseases, and self-reported mental and physical health in a multivariate model, participants with

inadequate health literacy were 1.3 times more likely to be hospitalized than those with adequate health literacy. Cardiovascular and pulmonary conditions were the most common discharge diagnoses.

Further analyses of the same data by Scott et al. (2002) attempted to determine whether older adults with inadequate health literacy were less likely to use preventive health services, specifically influenza and pneumococcal vaccinations among all participants and mammograms and Papanicolaou smears among women participants. The average age of the 2,722 participants was 71 years with 31% identified as having inadequate and marginal health literacy. Initial bivariate analysis revealed that participants with inadequate and marginal health literacy were significantly less likely to report receiving preventive health services when compared to those with adequate health literacy. After adjusting for demographics, education, number of physician visits within the last three months, and self-reported health status in multivariate analyses, participants with inadequate health literacy were significantly less likely to report receiving influenza and pneumococcal vaccinations; and women participants were significantly less likely to report receiving a mammogram and a Papanicolaou smear. The researchers concluded that inadequate health literacy was independently associated with less use of preventive health services. A later study using a nationally representative sample of 18,000 American adults further supported that inadequate health literacy is associated with less use of self-reported preventive health services in adults aged 65 years and older (White, Chen, & Atchison, 2008).

Baker et al. (2004) continued to analyze the data from the previous study to determine whether inadequate health literacy was a barrier to accessing physician

outpatient services. Participants with inadequate health literacy were more likely to have no physician visit and a longer time to their first visit, but more average physician visits during the first year after Medicare enrollment when compared to those with adequate literacy; however, the differences were not statistically significant. In addition, the researchers discovered that participants with inadequate and marginal health literacy were significantly more likely to have two or more emergency department (ED) visits when compared to those with adequate health literacy. The researchers concluded that inadequate health literacy does not appear to be a barrier to accessing physician outpatient services but the second finding of more ED visits may suggest that the participants used the ED as a substitute for routine office visits.

In a separate prospective cross-sectional study of 2,512 community-dwelling Medicare enrollees in two states, Sudore, Mehta, et al. (2006) wanted to determine the relationship between health literacy, demographics, and access to health care from 1997 to 2000. The Rapid Estimate of Adult Literacy in Medicine (REALM) was used to determine health literacy levels in the study participants. REALM scores of 0-8th grade reading levels indicated limited health literacy, while scores at or above the 9th grade reading level indicated adequate health literacy. Among the 2,512 participants, 24% had limited health literacy. Participants with limited health literacy were more likely to have fair to poor self-rated health and chronic medical conditions including hypertension, diabetes, obesity, and depressive symptoms. In the third year of the study, participants were assessed to determine if disparities exist in access to healthcare. Indicators of healthcare access included access to primary care, preventive services, and medications. After adjusting for socio-demographics, self-rated health status, comorbidities, and

education in multivariate analysis, the researchers reported that participants with a 6th grade reading level or less were 1.5 more times likely to have poor healthcare access to preventive services and insurance to cover medications.

Sudore, Yaffe, et al. (2006), with an additional four years of data, sought to determine if limited health literacy was associated with mortality in older adults. The researchers reported that 320 (12.7%) participants died between 1997 and 2004. Participant deaths with limited health literacy (19.7%) were higher when compared to participant deaths with adequate health literacy (10.6%). After adjusting for demographic and socioeconomic characteristics, co-morbidities, self-rated health status, health behaviors, health care access, and psychosocial status, participants with limited health literacy were still 1.75 times more likely to die than those with adequate health literacy. Cardiovascular disease, cancer, and cerebrovascular disease were identified as the three most common causes of death. The researchers concluded that limited health literacy was independently associated with mortality in older adults.

Using data from a previous study of community-dwelling Medicare enrollees in a national managed care organization located in four different states (Gazmararian et al., 1999), Baker et al. (2007) examined whether low health literacy was an independent predictor of mortality in the target population. The S-TOFHLA was used to identify health literacy levels among the participants. Among the 3,260 participants, approximately 36% had inadequate and marginal health literacy. The researchers reported that 815 (25%) of the participants died between 1997 and 2003. Participant deaths with inadequate (39.4%) and marginal (28.7%) health literacy were higher when compared to participant deaths with adequate health literacy (18.9%). After adjusting for demographic

characteristics, annual income, health status and health behaviors, participants with inadequate health literacy were 1.5 times more likely to die when compared to participants with adequate health literacy. Additionally, after adjusting for demographic characteristics, annual income, and health status but not health literacy, the researchers indicated that education level had no association with mortality. The researchers concluded that inadequate health literacy was an independent predictor of mortality among community-dwelling older adults.

Self-management of chronic conditions. Health care utilization, including hospital and outpatient services, and mortality rates are important indicators of patient health outcomes. Chronic diseases such as hypertension, diabetes, COPD and asthma require a high degree of self disease-management including administration of complex medication regimens, understanding life style modifications, recognition of disease symptoms, and understanding when to seek medical treatment. Patients with a chronic disease condition must self-manage their illness on a daily basis, but how well they manage their chronic disease condition may depend their understanding of it. Health outcomes, including hospitalizations and mortality rates, are affected by how well these diseases are managed. Wolf, Gazmararian, and Baker (2005) evaluated the association between health literacy, self-reported health status, and limitations in activities of daily living (ADL). Participants with inadequate health literacy were significantly more likely to report chronic medical conditions including hypertension, diabetes, heart failure, bronchitis or emphysema, and arthritis when compared to participants with adequate health literacy. In multivariate analysis controlling for socio-demographics, health behaviors, and chronic conditions,

participants with inadequate health literacy were significantly more likely to report poorer physical and mental health status and limitations in performing ADLs.

In a cross-sectional survey of 402 patients with hypertension and 114 patients with diabetes presenting at general medicine clinics at two urban hospitals, Williams, Baker, Parker, et al. (1998) sought to determine the relationship of patients' health literacy to the knowledge of their chronic diseases and markers of disease control. The TOFHLA was used to measure health literacy in which approximately 48% of the participants were identified as having inadequate health literacy and 12% had marginal health literacy. The researchers reported participants with hypertension who had inadequate health literacy were significantly less likely to know the normal range for blood pressure readings and those with diabetes were significantly less likely know normal blood glucose levels. In addition, participants with inadequate health literacy were significantly less likely to understand important lifestyle changes and self-management skills to manage their chronic disease.

Gazmararian, Williams, Peel, and Baker (2003) conducted a similar study using a convenience sample of 653 Medicare enrollees aged 65 years or older with at least one chronic disease condition including asthma, diabetes, congestive heart failure and hypertension. The majority of the participants reported having only one chronic disease condition while approximately 17% reported two conditions. The S-TOFHLA was used to measure health literacy and 24% were identified with inadequate health literacy skills and an additional 12% had marginal health literacy skills. Participant scores on the S-TOFHLA significantly correlated with disease knowledge. Those participants with inadequate health literacy had significantly less disease knowledge when compared to

participants with adequate health literacy. In addition, after controlling for health literacy, years of schooling was not associated with chronic disease knowledge.

Critical components in the self-management of asthma require routine physician visits; recognizing and responding to signs and symptoms of an asthma attack; and proper use of metered-dose inhalers (MDIs) including proper dosing and frequency instructions, and proper technique. Williams, Baker, Honig et al. (1998) recruited a convenience sample of 273 patients presenting in the emergency department for an asthma exacerbation in one urban hospital and 210 patients presenting in a specialized asthma clinic for routine care to examine the relationship of patients' health literacy to their asthma knowledge and MDI technique. Eligible participants were enrolled in the study sequentially while awaiting medical care. Reading ability was measured using the REALM and asthma self-management skills were assessed through participant MDI technique demonstration and completion of an orally administered asthma knowledge questionnaire. Sixty-eight percent of the participants reported graduating from high school; however, only 27% had adequate reading skills while 73% had marginal and inadequate reading skills. Using multivariate analysis, the researchers reported that inadequate reading skills were associated with less asthma knowledge and improper MDI technique. In addition, participants with inadequate reading skills were less likely to seek routine medical care for their asthma, understand asthma medication frequency instructions, understand the importance of proper MDI technique, and know to avoid allergens.

Understanding that asthma is a common chronic respiratory condition that requires long-term self-disease management and physician follow-up care, Mancuso and

Rincon (2006a) conducted a longitudinal cohort study to determine the association between health literacy and asthma outcomes. Several instruments were used in the study that included the TOFHLA to measure health literacy, the Asthma Quality of Life Questionnaire (AQLQ) to measure asthma outcomes, the Medical Outcomes Study SF-36, and emergency department visits. The SF-36 and AQLQ were administered at enrollment and every six months while emergency room visits were measured through self-report every three months for two years. Among the 175 participants, 10% had inadequate and 8% had marginal health literacy. In addition, participants completed the Asthma Self-Efficacy Scale to determine confidence in managing their asthma, the Check Your Asthma IQ survey to assess asthma knowledge, Geriatric Depression Scale to assess depressive symptoms, and they were asked about peak flow meter usage. The researchers conducted a bivariate analysis and found that low health literacy was associated with decreased quality of life, decreased physical function, and more emergency department visits for the treatment for asthma during the study time frame. In a multivariable model, health literacy remained statistically significant for all asthma outcomes when asthma severity and self-efficacy were added to the model. However, when age, education, and depressive symptoms were added to the model, health literacy remained statistically significant only for emergency department visits and did not remain statistically significant for any of the asthma outcomes when asthma knowledge was added to the model. Based on the results, the Mancuso and Rincon (2006a) indicated that low health literacy is associated with poor asthma outcomes and may impact asthma outcomes through its effects on other variables, namely asthma knowledge.

Using the same data, Mancuso and Rincon (2006b) further explored the association of health literacy to patients with asthma assessments of their care and their desire to participate in making treatment decisions. The majority of the participants were of minority status including African-American (31%), Latino (41%), and other or mixed race/ethnicity (8%). Additionally, marginal and inadequate health literacy levels were identified only in these groups. Of the 50% of all participants reporting that they were dissatisfied or very dissatisfied with their asthma status, participants with marginal or inadequate health literacy reported more dissatisfaction with their asthma status. Even though health literacy was not related to access to asthma care, participants with marginal or inadequate health literacy were more likely to report poorer asthma care and greater difficulty accessing care for other medical conditions. Furthermore, participants with inadequate or marginal health literacy were 3.5 times less likely to want to participate in making decisions about their asthma treatment. DeWalt, Boone, and Pignone (2007) found similar results in their study of 268 patients presenting at an academic general internal medicine practice. They hypothesized that inadequate health literacy was related to less self-efficacy, less physician trust, and less desire to participate in medical decision-making. Participants with inadequate health literacy were significantly less likely to participate in medical decision-making ($p<0.001$) and had less disease knowledge ($p<0.001$), but inadequate health literacy was not associated with less self-efficacy or less physician trust.

Even though the literature provides substantial supporting evidence that health literacy impacts the ability for patients to manage their chronic disease conditions, the evidence remains sparse regarding implementation of effective interventions to reduce

the impact of health literacy on managing these chronic disease conditions to improve patient outcomes. Pignone, Dewalt, Sheridan, Berkman, and Lohr (2005) conducted a systematic review of health literacy interventions designed to improve patient outcomes. Of the 20 articles included in the systematic review, only five articles measured the effectiveness of the intervention when comparing participants with inadequate health literacy to those with adequate health literacy; however, the results of the studies were mixed.

One study not included in the systematic review, conducted by Paasche-Orlow et al. (2005), was a prospective cohort study of adults admitted to the hospital for severe asthma exacerbation at two urban hospitals to determine if inadequate health literacy was associated with lower asthma medication knowledge, improper metered-dose inhaler (MDI) technique, and difficulty learning and retaining asthma self-management skills. A convenience sample of 73 participants was screened using the S-TOFHLA to measure health literacy levels, which identified 22% with inadequate health literacy. Participants with inadequate health literacy were more likely to be hospitalized for asthma in the last 12 months when compared to participants with adequate health literacy; and although it was not statistically significant, participants with inadequate health literacy experienced higher rates of near-fatal asthma exacerbations. In addition, inadequate health literacy was an independent predictor of less asthma medication knowledge and improper MDI technique. However, after instruction, the researchers reported no significant difference between participants with inadequate and adequate health literacy during follow-up visits on understanding discharge regimens, adherence to corticosteroid therapy, or asthma symptom control indicating that inadequate literacy was not associated with difficulty in learning and retaining instructions about asthma self-management.

Medication errors. An essential component of self-managing chronic disease conditions is the ability to properly take medications as prescribed by the physician. Several studies have investigated the relationship between health literacy and medication errors among patients. Kripalani, Henderson, et al. (2006) used data from a randomized, controlled trial to determine the association of health literacy, cognitive function, medication regimen complexity, and socio-demographics with medication management capacity in patients diagnosed with coronary heart disease. The REALM was used to measure health literacy and identified 51% of the participants with inadequate health literacy and another 26% with marginal health literacy. Overall, 38% of the 152 participants were unable to identify all of their medications even when the medications were available to review. In addition, 57% of participants with inadequate health literacy were unable to identify all of their medications. Another study found that 60% of the 251 patients presenting at one primary care center had inadequate and marginal health literacy, as measured by the REALM, with 42% reporting less than a high school education (Davis, Wolf, Bass, Middlebrooks et al., 2006). After adjusting for socio-demographics, number of prescribed medications, and warning label reading difficulty level, participants with inadequate health literacy were 3.4 times less likely to correctly interpret eight of the most common prescription warning labels (95% CI, 2.3 to 4.9).

Davis, Wolf, Bass, Thompson et al. (2006) conducted a cross-sectional study using a convenience sample of 395 patients presenting at primary care clinics located in three urban areas to determine if low health literacy was associated with misunderstanding of labels on prescription bottles. Using the REALM to measure health literacy levels, approximately 50% of the participants were identified as having

inadequate and marginal health literacy levels ($< 9^{\text{th}}$ grade reading level). Participants with inadequate and marginal health literacy were significantly more likely to misunderstand medication label instructions. Even more alarming, as the number of individual prescribed medications increased, the risk for misunderstanding the medication label instructions also increased (adjusted relative risk [ARR] 3.22, 95% CI 1.53 to 6.77 for 3 to 4 medications; and ARR 2.98, 95% CI 1.40 to 6.34 for 5 or more medications) (Davis, Wolf, Bass, Thompson et al., 2006). The researchers noted, however, that 38% of the participants with adequate health literacy levels still misunderstood at least one medication label indicating that a less complex and more explicit prescription drug labeling may be needed.

Persell, Osborn, Richard, Skripkauskas, & Wolf (2007) explored the relationship between health literacy, patient recall of antihypertensive medications, and medication reconciliation. The researchers conducted in-person interviews of 119 patients presenting at three primary care clinics in one city. Health literacy was measured using the S-TOFHLA in which 31% of the participants had inadequate health literacy. Participants with inadequate health literacy were significantly less likely to name any of their antihypertensive medications when compared to those with marginal and adequate health literacy (59.5% vs. 31.7%, $p < 0.005$). Patient-reported and medical-record reported agreement (medication reconciliation) was significantly lower for participants with inadequate health literacy when compared to those with adequate health literacy ($p = 0.023$). The researchers suggested that chronic disease conditions requiring complex medication regimens could increase the risk of medication errors or nonadherence. George, Kong, Thoman, and Stewart (2005) provided additional supporting evidence

indicating that complex treatment regimens can contribute to medication nonadherence. In a convenience sample of 276 patients with chronic pulmonary conditions enrolled in 12 respiratory support groups and one pulmonary rehabilitation program, participants cited confusion about their medications as a primary reason for not taking their medications as directed. Maniaci, Heckman, and Dawson (2008) found that 15% of the participants in their study were unaware that they were prescribed any new medications at hospital discharge and almost 30% did not know proper dosage, frequency and purpose of their new medications. In addition, only 22% of the participants could name an adverse effect of a new medication and only 11% reported receiving information about potential medication adverse effects at hospital discharge. The inability to follow prescribed medication regimens can lead to improper administration, dosing and frequency of medications resulting in adverse events that may result in hospitalization or even death.

Prescription medications labels are not alone in the complexity of their instructions. Over-the-counter (OTC) medication instructions can be just as complex if not more. Stevens, McDaniel, Glover, and Wallace (2007) examined the readability characteristics of step-by-step instructions in the “How to Use” sections of six different OTC nicotine therapy replacement (NTR) products. Readability was assessed using the Simple Measure of Gobbledygook (SMOG) formula in which words greater than three syllables are identified and totaled from selected groups of sentences. The average readability of the OTC NTR products was at a tenth grade level. This is well above the fifth to sixth grade reading level recommended for all health related printed materials (Doak et al., 1996; Winslow, 2001). Only two out of the six OTC NTR products provided supplemental illustrations in the “How to Use” sections. Improper use of OTC NTR

products by individuals who want to quit smoking may lead to decreased success rates and discourage future smoking cessation attempts because of the perceived ineffectiveness of these products.

Financial burden of inadequate health literacy. Healthcare costs associated with medication errors are substantial. Research supports the role of inadequate health literacy in patient related medication errors (Davis, Wolf, Bass, Middlebrooks et al., 2006; Davis, Wolf, Bass, Thompson et al., 2006; Kripalani, Henderson, et al., 2006; Maniaci et al., 2008; Persell et al., 2007; Stevens et al., 2007). According to the IOM report, *Preventing Medication Errors*, an estimated 1.5 million preventable adverse drug events occur annually in the United States at a cost of \$3.5 billion (Aspden, Wolcott, Bootman, & Cronenwett, 2007). Approximately one-third of those preventable adverse drug events occur outside the hospital setting at a cost of nearly \$2,000.00 per adverse drug event to total nearly \$1 billion annually. These financial figures are relatively small when compared to the overall cost associated with inadequate health literacy. Previous estimates of the additional financial burden associated with inadequate health literacy on the health care system were estimated to be approximately \$73 billion annually (Center on an Aging Society, n.d.); however, recent estimates bring that number to be in the range of \$106 to \$236 billion annually in the United States (Vernon, Trujillo, Rosenbaum, & DeBuono, 2007). Even more troubling, the future costs calculated in present day dollars are estimated to be \$1.6 to \$3.6 trillion annually.

Weiss and Palmer (2004) randomly selected participants enrolled in a large southwest managed Medicare plan to determine if inadequate health literacy was associated with higher medical costs. Using the Instrument for the Diagnosis of Reading

(IDR), 24% of the 74 participants had inadequate health literacy. Participants with inadequate health literacy had significantly higher medical costs when compared to those with higher health literacy (\$10,688 vs. \$2890; $p=0.025$). Inpatient care charges contributed two-thirds of the cost for participants with inadequate health literacy when compared to less than one-third of the cost for participants with higher health literacy. Reading level remained a significant predictor of costs after controlling for socio-demographic characteristics and health status; however, education level was not associated with increased costs. A much larger study examined the relationship between health literacy and medical care costs among 3,260 enrollees in a Medicare managed care plan. The researchers reported that participants with inadequate health literacy had a significantly higher probability of using inpatient and emergency room care and significantly higher emergency room costs when compared to those with adequate health literacy (\$108; 95% CI: \$62 to \$154; $p<0.0001$); however, they reported only marginal statistical significance persisted for total ($p=0.06$) and inpatient ($p=0.08$) costs after adjusting for socio-demographics, health behaviors, and health status (Howard, Gazmararian, & Parker, 2005).

Higher rates of chronic disease coupled with less use of preventive health services can lead to increased hospitalizations and health costs that place an increased health and financial strain on older adults, which ultimately places an increased strain on the healthcare system. In order to move ahead and develop effective patient education materials and delivery methods, it is important to find effective measurement techniques that identify health literacy levels.

Table 1

Selected Published Studies on the Consequences of Low Health Literacy

Reference	<i>n</i>	Setting	Health Literacy Instrument	Outcome
Healthcare Utilization & Mortality				
Baker et al., 1998	979	Large, urban public hospital	TOFHLA	Hospitalization of one or more times was significantly higher for participants with inadequate health literacy when compared to those with marginal and adequate health literacy. The findings persisted after adjusting for demographics, socioeconomic status, self-reported health, and health insurance coverage.
Baker et al., 1997	2,659	Two large, urban public hospitals	TOFHLA	Participants with inadequate health literacy were more likely to report poor health and being hospitalized in the year prior to the study when compared to those with adequate health literacy. The findings persisted after adjusting for demographics and socioeconomic indicators.
Baker et al., 2002	3,260	Medicare national managed care organization in four urban areas	S-TOFHLA	Hospitalization rates were significantly higher for participants with inadequate and marginal health literacy when compared to those with adequate health literacy. The findings persisted after adjusting for socio-demographics, income, education, health behaviors, chronic diseases, and self-reported physical and mental health.

Table 1 (continued)

Reference	<i>n</i>	Setting	Health Literacy Instrument	Outcome
Scott et al., 2002	2,722	Medicare national managed care organization in four urban areas	S-TOFHLA	Participants with inadequate and marginal health literacy were significantly less likely to report receiving preventive health services including influenza and pneumonia vaccinations, mammograms, and a Pap smear. The finding persisted after adjusting for demographics, education, number of physician visits, and self-reported health status.
White et al., 2008	18,000	NAAL	Health- related tasks	Participants aged 65 years and older with inadequate health literacy were more likely to report less use of preventive health services.
Baker et al., 2004	3,260	Medicare national managed care organization in four urban areas	S-TOFHLA	Inadequate health literacy was not associated with less outpatient physician visits. Participants with inadequate and marginal health literacy were significantly more likely to have two or more ED visits when compared to those with adequate health literacy.
Sudore, Mehta, et al., 2004	2,512	Medicare enrollees in the Health, Aging, and Body Composition study in two urban areas	REALM	Participants with inadequate health literacy were more likely to report poor self-rated health and chronic disease conditions. Participants with inadequate health literacy were 1.5 times less likely to have health care access to preventive services and insurance to cover medications.

Table 1 (continued)

Reference	<i>n</i>	Setting	Health Literacy Instrument	Outcome
Surdore, Yaffe, et al., 2004	2,512	Medicare enrollees in the Health, Aging, and Body Composition study in two urban areas	REALM	Participants with inadequate health literacy were 2 times more likely to die when compared to those with adequate health literacy. The findings persisted after adjusting for demographic and socioeconomic characteristics, comorbidities, self-rated health status, health behaviors, health care access, and psychosocial status.
Baker et al., 2007	3,260	Medicare national managed care organization in four urban areas	S-TOFHLA	Participant deaths were higher for participants with inadequate and marginal health literacy when compared to those with adequate health literacy. After adjusting for demographics, income, health status and health behaviors, participants with inadequate health literacy were 1.5 times more likely to die when compared to those with adequate health literacy.
Self-Management of Chronic Disease				
Wolf et al., 2005	2,923	Medicare national managed care organization in four urban areas	S-TOFHLA	Participants with inadequate health literacy were more likely to report more chronic medical conditions. After adjusting for socio-demographics, health behaviors, and chronic conditions, participants with inadequate health literacy reported poorer physical and mental health status and limitations in ADLs.

Table 1 (continued)

Reference	<i>n</i>	Setting	Health Literacy Instrument	Outcome
Williams, Baker, Parker, et al., 1998	516	General medicine clinics at two urban, public hospitals	TOFHLA	Inadequate health literacy was associated with less disease knowledge and less understanding of disease self-management skills.
Gazmararian et al., 2003	653	Medicare national managed care organization in four urban areas	S-TOFHLA	Participants with inadequate health literacy had significantly less disease knowledge when compared to those with adequate health literacy.
Williams, Baker, Honig, et al., 1998	273	ED and asthma clinic at one urban, public hospital	REALM	Inadequate health literacy was associated with less asthma knowledge and improper MDI use. Participants with inadequate health literacy were less likely to seek routine medical care for their asthma, understand asthma medication frequency instructions, understand the importance of proper MDI technique, and know to avoid allergens.
Mancuso et al., 2006a	175	Primary care practice in one urban area	TOFHLA	Inadequate health literacy was associated with decreased QOL and physical function, and more ED visits for asthma. The findings persisted only for ED visits when controlling for asthma severity, self-efficacy, age, education, and depressive symptoms.

Table 1 (continued)

Reference	<i>n</i>	Setting	Health Literacy Instrument	Outcome
Mancuso et al., 2006b	175	Primary care practice in one urban area	TOFHLA	Participants with inadequate health literacy were more likely to report poorer asthma care and more difficulty in accessing care for other medical conditions. Participants with inadequate health literacy were 3.5 times less likely to want to participate in medical decisions about asthma treatment.
Dewalt et al., 2007	268	Academic general internal medicine practice	REALM	Participants with inadequate health literacy were significantly less likely to participate in medical decisions and had less disease knowledge. Inadequate health literacy was not associated with less self-efficacy or less physician trust.
Paasche-Orlow et al., 2005	73	Two urban academic medical centers	S-TOFHLA	Participants with inadequate health literacy were more likely to be hospitalized for asthma when compared to those with adequate health literacy. Inadequate health literacy was associated with less asthma medication knowledge and improper MDI use, but not associated with difficulty in learning or retaining instructions for asthma self-management.
Medication Errors				
Kripalani et al., 2006	152	Three primary care clinics in three cities.	REALM	Inadequate health literacy was associated with less ability to correctly identify medications.

Table 1 (continued)

Reference	<i>n</i>	Setting	Health Literacy Instrument	Outcome
Davis, Wolf, Bass, Middlebrooks, et al., 2006	251	Primary care clinic in a public hospital	REALM	Multivariate analysis indicated that participants with inadequate health literacy were 3 times less likely to correctly interpret eight of the most common medication warning labels.
Davis, Wolf, Bass, Thompson, et al., 2006	395	Three outpatient primary care clinics in three cities.	REALM	Participants with inadequate health literacy were significantly less likely to understand medication labels. The risk for misunderstanding medication labels increased as the number of individual prescribed medications increased.
Persell et al., 2007	119	Three primary care clinics in one city	S-TOFHLA	Participants with inadequate health literacy were significantly less likely to name any of their antihypertensive medications when compared to those with marginal and adequate health literacy. Medication reconciliation was significantly lower for participants with inadequate health literacy when compared to those with adequate health literacy.

Table 1 (continued)

Reference	<i>n</i>	Setting	Health Literacy Instrument	Outcome
Financial Burden				
Weiss et al., 2004	74	Large southwest managed Medicaid plan	IDR	Participants with inadequate health literacy had significantly higher medical costs when compared to those with higher health literacy (\$10,688 vs. \$2,890, $p=0.025$). Inpatient care charges contributed two-thirds of the cost for participants with inadequate health literacy when compared to less than one-third of the cost for participants with higher health literacy.
Howard et al., 2005	3,260	Medicare national managed care organization in four urban areas	S-TOFHLA	Participants with inadequate health literacy had a significantly higher probability of using inpatient and emergency room care and significantly higher emergency room costs when compared to those with adequate health literacy (\$108, 95% CI: \$62 to \$154; $p<0.0001$).

Note. NAAL, National Assessment of Adult Literacy (health literacy component of 28 health related tasks); TOFHLA, Test of Functional Health Literacy in Adults; S-TOFHLA, Short- TOFHLA; ED, Emergency Department; REALM, Rapid Estimate of Adult Literacy in Medicine; ADLs, Activities of Daily Living; MDI, Metered-Dose Inhaler; IDR, Instrument for the Diagnosis of Reading.

Measuring Health Literacy

Do health care providers screen their patients for health literacy skills? At this time, the answer remains unclear. Systematic and consistent assessment may not be conducted due to a lack of available time or lack of training in this area. Typically, if health literacy screening is conducted, health care providers rely on self-reported educational attainment and reading abilities. The average American adult reads several

grade-levels below the last completed grade of formal education; additionally, most patients with low literacy skills report that they read “well or very well” (Doak et al, 1996). Patients with low health literacy skills are difficult to identify because they may deny or hide their inability to read because of the feeling of shame, inadequacy, or stigma (Kickbusch, 2001). In a study of 202 patients presenting at a large urban hospital, approximately 43% had inadequate or marginal health literacy with almost 68% admitting they had trouble reading and understanding written materials (Parikh et al., 1996). Participants with inadequate health literacy revealed they felt shame due to their inability to read and half of all the participants with inadequate and adequate health literacy reported that the feeling of shame would be so great that they would never tell anyone about their reading difficulties. Two-thirds of the participants with inadequate health literacy never told their spouses and more than half never told other members of their families or friends.

Several health literacy screening instruments that can be administered in a few minutes are available to assist health care providers in identifying patients with low health literacy skills. Table 2 summarizes the health literacy assessment instruments presented in this section. These instruments include but are not limited to the S-TOFHLA (Baker, Williams, Parker, Gazmararian, & Nurss, 1999), the REALM (Davis et al., 1993), the REALM – Revised (REALM-R) (Bass, Wilson, & Griffith, 2003), and the Newest Vital Sign (NVS) (Weiss et al., 2005). However, patients may be reluctant to participate in these screening procedures because they may not want this information included in their medical records. It is important for both healthcare providers and their patients to understand the urgency to take action against low health literacy in order to

provide effective patient-provider communication and interventions to reduce the consequences associated with low health literacy.

The REALM and REALM-R

The REALM is a 66-item word recognition test designed to provide a quick estimate of an individual's health literacy skills in the clinical setting. The REALM consists of three columns with 22 common lay medical terms arranged by increasing order of difficulty (Davis et al., 1993). Patients are asked to pronounce as many of the words as possible starting with the first word in the first column. The REALM has good reliability and validity as an instrument that provides an estimate of an individual's reading abilities. The criterion validity of the REALM was based on correlations between the REALM raw scores and the raw scores of three standardized reading tests used with adults. The tests included the Slosson Oral Reading Test-Revised (SORT-R); the Wide Range Achievement Test Revised (WRAT-R); and the word recognition sections of the Peabody Individual Achievement Test-Revised (PIAT-R), which also contain reading comprehension sections. The correlation coefficients indicated that the REALM highly correlated with the SORT-R (0.96), WRAT-R (0.88), PIAT-R (0.97) (Davis et al, 1993), and the S-TOFHLA (0.80) (Baker et al., 1999). The test-retest reliability of the REALM was 0.97 (Davis et al, 1993). Other advantages to the REALM include minimal required training to administer the test, it can identify patients who cannot read at all, it can be administered and scored in approximately five minutes, and it is considered public domain and can be used freely with proper citation (Davis et al, 1993; Cutilli, 2005). However, the REALM is not valid in Spanish and does not estimate reading levels above the ninth grade (Cutilli, 2005; Parker, 2000).

The REALM-R, a shortened version of the REALM, is a new 8-item word recognition test designed to quickly identify patients at risk for low health literacy (Bass et al., 2003). The REALM-R includes 11 words taken from the REALM. The first three words are not scored, but they are used as introductory words to help reduce test anxiety and increase patient confidence. A score of 6 or less is used to identify patients with low health literacy. The REALM-R had good internal consistency (Cronbach's alpha 0.91) and correlated with the REALM (0.72) and the WRAT-R (0.64); additionally, the time required to administer the REALM-R was less than 2 minutes, which suggests that it is a practical screening tool for a busy health care setting.

The S-TOFHLA

The S-TOFHLA measures an individual's health literacy in the healthcare setting by assessing reading comprehension and numeracy skills (Mika et al, 2005). The S-TOFHLA is available in English and Spanish and it can be administered in approximately 7 to 12 minutes compared to 22 minutes for test administration of the full version TOFHLA, (Parker, 2000) which can improve its application abilities in the clinical setting. The S-TOFHLA had good internal consistency for the 4 numeracy items (Cronbach's alpha 0.68) and for the 36 Cloze items in the reading comprehension (Cronbach's alpha 0.97) (Baker et al, 1999) and was highly correlated with the REALM (0.80, $p < 0.001$). The S-TOFHLA is a copyrighted instrument, but it can be purchased for a modest fee. Use of these tools in the clinical setting can allow for immediate action to prevent negative consequences associated with low health literacy.

The NVS

The NVS is a 6-item nutritional label scenario designed to provide a quick and practical method for identifying patients with low health literacy. The NVS is the first health literacy screening test available in English (NVS-E) and Spanish (NVS-S) that can be administered in approximately 3 minutes (Weiss et al, 2005). The NVS-E and NVS-S had good internal consistency (Cronbach's alpha of 0.76 and 0.69, respectively), and were positively correlated with the each respective version of the TOFHLA. The ability of the NVS-E and NVS-S to predict low health literacy (TOFHLA scores) was significantly higher than for education and age alone. The researchers concluded that the NVS appeared to be a promising health literacy assessment tool that can be useful in a busy health care setting, but recommended further testing in other primary care practices and non-primary care settings.

Osborn et al. (2007) conducted a follow-up study using a convenience sample of patients presenting at one primary care clinic in the Southeast and at two primary care clinics in the north Midwest to compare the performance of the NVS-E with the two most commonly used health literacy assessments. The NVS-E and REALM were administered to one group consisting of 129 participants while the NVS-E and S-TOFHLA were administered to a separate group consisting of 119 participants. In the group comparing NVS-E and REALM, the NVS-E had good internal consistency (0.81) but only a moderate correlation to the REALM ($r=0.41$, $p<0.001$). In the second group comparing the NVS and S-TOFHLA, the NVS-E still had good internal consistency (0.71) and a stronger correlation with the S-TOFHLA ($r=0.61$). The NVS-E had significant predictability of inadequate health literacy as determined by the REALM and S-

TOFHLA. Unlike the S-TOFHLA, the NVS-E was not a significant predictor of health knowledge and outcomes measured in the study. Noted limitations included not comparing all three instruments simultaneously and order of the instrument administration was not varied. The researchers indicated that the NVS-E is a more difficult assessment for patients but may be more representative of an everyday health related activity.

Additional Methods of Identifying Low Health Literacy

Understanding food labels is important for everyone, especially for those patients with specific dietary recommendations due to chronic disease conditions. Rothman et al. (2006) conducted a cross-sectional study of 200 patients presenting at one primary care clinic to examine food label comprehension and the relationship to literacy and numeracy skills. The REALM was used to measure health literacy and the WRAT-3 was used to measure numeracy skills. Participants with inadequate health literacy and inadequate numeracy skills were 23% and 63% respectively. Food label comprehension was measured by a nutritional label survey. Nearly 60% of participants reported using food labels at least a few times per week. Participants with inadequate health literacy and numeracy skills were significantly less likely to use the serving size information correctly, pick out relevant information, and make correct calculations when compared to those with adequate health literacy and numeracy skills. The findings persisted after adjustment for socio-demographics, health status, and reading-label frequency, thus providing further evidence of using nutritional labels to assess patient comprehension of health-related activities.

Table 2

Health Literacy Assessment Instruments

Instrument	Aspect Measured	Scoring	Time to Administer	Correlation	Language
REALM (Davis et al., 1993)	Word Pronunciation	0-18, $\leq 3^{\text{rd}}$ grade; 19-44, 4 th -6 th grade; 46-60, 7 th -8 th grade; 61-66, $\geq 9^{\text{th}}$ grade	3-5 minutes	PIAT-R 0.97 SORT-R 0.96 WRAT-R 0.88	English
REALM-R (Bass et al., 2003)	Word Pronunciation	≤ 6 , risk for health literacy problems	< 2 minutes	REALM 0.72 WRAT-R 0.64	English
S-TOFHLA (Baker et al., 1999)	Reading comprehension and numeracy	0-53, inadequate; 54-66, marginal; 67-100, adequate	12 minutes	REALM 0.80	English and Spanish
NVS (Weiss et al., 2005; Osborn et al., 2007)	Reading comprehension and numeracy	0-1, likely low literacy; 2-3, possibility of low literacy; ≥ 4 , adequate	3 minutes	TOFHLA-E 0.59 TOFHLA-S 0.49 REALM 0.41 S-TOFHLA 0.61	English and Spanish

Note. REALM, Rapid Estimate of Adult Literacy in Medicine; REALM-R, REALM-Revised; S-TOFHLA, Short Test of Functional Health Literacy in Adults; TOFHLA-E, TOFHLA-English; TOFHLA-S, TOFHLA-Spanish; SORT-R, Slosson Oral Reading Test-Revised; WRAT-R, Wide Range Achievement Test Revised; PIAT-R, Peabody Individual Achievement Test-Revised; NVS, Newest Vital Sign.

Chew, Bradley, and Boyko (2004) developed 16 screening questions to identify areas of potential problems for patients with low health literacy that included accessing the health care system, understanding recommended treatments, and following the instructions of health care providers. The 16 questions, with a 5-point rating scale design were compared to the S-TOFHLA. Three of the 16 questions were determined as most effective in identifying low health literacy that included the following: 1) "How often do

you have someone help you read hospital materials?” 2) “How confident are you filling out medical forms by yourself?” and 3) “How often do you have problems learning about your medical condition because of difficulty understanding written information?” with AUROC curves of 0.87, 0.80, and 0.76, respectively (Chew et al, 2004).

Wallace, Rogers, Roskos, Holiday, and Weiss (2006) found that of the three screening questions identified by Chew et al. (2004) “How confident are you filling out medical forms by yourself” was most effective in identifying patients with inadequate health literacy and inadequate to marginal health literacy when compared to the REALM with AUROC curves of 0.82 and 0.79, respectively. This prompted a follow-up study by Chew et al. (2008) to further evaluate the performance of the three screening questions for detecting inadequate and marginal health literacy by recruiting a random sample of 1,796 patients receiving primary care services at four urban Veterans Association medical centers. Health literacy was measured by the REALM and S-TOFHLA. Statistical analysis revealed that the question “How confident are you filling out medical forms by yourself” performed significantly better in identifying inadequate health literacy and inadequate to marginal health literacy when compared to the other two questions ($p < 0.05$) as defined by the REALM (AUROC of 0.84 and 0.71, respectively) and S-TOFHLA (AUROC of 0.74 and 0.72, respectively). The researchers indicated that a single question could be used to screen patients for inadequate health literacy. With further investigation and validation in different patient populations, these questions could be incorporated into the general patient admissions process to quickly assess low health literacy without causing embarrassment and anxiety to patients. Similar admissions

screening methods are currently used to identify patients who are at risk for post-surgical pulmonary complications with obstructive sleep apnea (OSA).

Most professionals agree that use of structured measurement instruments is optimal when assessing low health literacy in the clinical setting; however, it may not always be practical in every situation. Even though recognizing and determining health literacy skills can be difficult at times, there are some simple methods to quickly assess reading abilities without the use of formal testing instruments. Potential reading problems may be identified when patients fill out forms incorrectly or incompletely, request to take forms home to complete, ask assistance from a friend or family member, or make excuses why they cannot read the information such as stating that they forgot their glasses. Using methods such as asking patients to read a real prescription label on a pill bottle or handing them a form upside-down to see if they will turn it right-side-up while attempting to read may provide some clues to their ability to read.

Patient Education Strategies

Identifying health literacy is only the first step in the process of improving patient education materials and methods of delivery. It is important to realize that adult learning is a personal process and it can be unique to each individual. Along with health literacy, understanding adult learning principles and adult learning styles will help healthcare professionals develop effective patient education materials and methods of delivery needed to address the growing population of older adults.

Adult Learning Considerations

To enhance patient learning, healthcare professionals should consider individual learning preferences when designing patient education materials and delivery methods.

Learning styles are the methods and environments in which individuals prefer to receive and understand information (Knowles, Holton, & Swanson, 1998). Learning can be inhibited depending on the environment, especially for patients who may be affected by stressors associated with illness and physical limitations (Bass, 2005). Health care professionals may only use a limited number of educational strategies with the assumption that this approach is adequate in meeting the learning needs of patients. It may be helpful to use a variety of educational strategies to meet the diverse learning needs of patients. The use of a variety of patient educational materials and delivery methods may facilitate patient retention and understanding of important medical information, thus improving patient health outcomes.

Adult learning principles. The development of effective instructional strategies depends on the healthcare professional's ability to recognize and understand the characteristics of the adult learner. In the early 1970s, Malcolm Knowles was the first to introduce the term andragogy and the concept that adults and children learn differently (Knowles et al., 1998). Andragogy is described as the set of adult core learning principles that apply to all adult learning situations. The six core principles described by Knowles et al. (1998) are:

1. Adults need to know the why, how, and what of learning.
2. Self-concept is the need for autonomy and self-direction.
3. Prior experience and knowledge implies that adult learners bring a set of life experiences and knowledge to any learning situation.
4. Readiness to learn is the need to learn based on occurring life situations.
5. Orientation to learning is life-centered.

6. Motivation to learn implies that learning is based on intrinsic value and personal value.

In order for learning to take place, healthcare professionals need to know how to apply the core adult learning principles to patient education situations. In addition to the adult core principles of andragogy, John (1988) introduced the concept of *geragogy*, which includes the adult core learning principles and addresses teaching strategies designed to compensate for the physical, sensory, and cognitive deficits of older adults (Hayes, 1998). The core adult learning principles provide the foundation for developing effective education programs. Additionally, it is suggested that thorough assessment be conducted of the individual learner characteristics, subject matter characteristics, and the situational characteristics (Knowles et al., 1998).

Learning style preferences of older adults. In a study conducted on older adults to determine learning style preference, Truluck and Courtenay (1999) found that adults aged 55 to 60 preferred learning by feeling and doing; the 66 to 74 age group preferred to learn by watching and listening; and those aged 75 years and older preferred to learn by watching, thinking, and listening. These results suggest that as older adults continue to age they may become less active and hands-on in their learning approach, but instead become more reflective and observational in their learning approach. Another study in 2001, found that 62% preferred learning by listening, 23% preferred learning by feeling and doing, and 15% preferred learning by watching (Van Wynen, 2001). The results suggested that older adults preferred receiving information by verbal methods rather than by reading written information. The majority of patient education materials are in the form of written information, which appears not to be the preferred method for older

adults. It is important to recognize that older adults have different learning styles and needs, and that no one method should be used exclusively.

Designing Effective Patient Education Materials

Healthcare professionals rely heavily on written materials to aid in providing important medication information; however, they may be unaware of the gap between patients' literacy levels and the reading levels at which written medical materials are written. Designing effective patient education materials is a comprehensive process involving many steps and must take in consideration anyone who may potentially use the education materials in the developmental process. Because chronic disease conditions required long-term management, patients are expected to assume more responsibility for self-managing their chronic conditions by following recommended long-term medication and treatment regimens and lifestyle changes. Effective patient education materials can assist healthcare professionals in relaying the necessary health information patients need to better manage their chronic diseases.

Seligman et al. (2007) developed a 6-step process for creating low health literacy patient education materials to increase knowledge and activate patients toward healthier behaviors. First, assemble a working team and solicit input from critical stakeholders including healthcare providers, patients, families, and caregivers. Solicit feedback from stakeholders early in the development process to ensure relevance, accuracy, and clarity of the information. Second, identify key concepts and determine how it will be communicated. Limit the number of concepts to no more than two or three essential concepts to avoid overwhelming or confusing patients with inadequate health literacy skills. Third, map concepts to a behavior theory and create a brief intervention, such as a

patient created action plan, to encourage the use of the written materials. Assisting patients in creating personal action plans actively involves them in the care process by setting short-term and eventually long-term goals toward healthier behaviors. Fourth, use recommended approaches to lower the reading level and improve readability for patients with inadequate health literacy. Fifth, refine materials by soliciting feedback from healthcare providers and patients. Finally, assess success and effectiveness of patient education materials through successful distribution to the intended patient population and positive changes in patient knowledge and health behavior changes.

Even individuals who read well and do not have cognitive or sensory deficits prefer receiving information through easy to read materials (Doak et al, 1996), pictures, videotapes, audiotapes or multi-media presentations (Parker, 2000). Several methods can be used to improve the design of written materials and delivery methods for patient education information. Suggestions for developing written materials are as follows (Aldridge, 2004; Ivnik & Jett, 2008; Seligman et al., 2007; Winslow, 2001):

1. Use familiar words that are less than three syllables.
2. Be consistent with word usage throughout the material.
3. Avoid use of medical jargon.
4. Use short sentence structures of 10 to 15 words.
5. Use bulleted items to draw attention to key concepts.
6. Limit to two or three main concepts.
7. Use second-person (you) instead of first-person (I) or third-person (the patient).
8. Use active voice rather than passive voice.
9. Use numerals (e.g. 1,2) rather than spelled numbers (e.g. one, two).

10. Use serif font types (e.g. Times New Roman) with a 12-point or larger font size for better readability.
11. Avoid using ALL CAPS because it is harder to read.
12. Use bold print only to emphasize key concepts.
13. Use culturally appropriate graphics, pictures, and illustrations that are relevant to the message.
14. Provide adequate white space.

It is recommended that patient written materials be developed at the fifth to sixth grade reading level (Aldridge, 2004). Several commonly used readability assessments are available to determine the reading level of written health care materials including the SMOG formula, Gunning Frequency of Gobbledygook (FOG) Index, Fry formula, Flesch Reading Ease (FRE) Scale, and Flesch-Kincaid (F-K) Readability formula. Table 3 summarizes the readability instruments for assessing written health materials.

The SMOG formula determines readability by counting the number of words that have three or more syllables in 10 sentences in a row at the beginning, middle, and end of the document for a total of 30 sentences (McLaughlin, 1969). Add the total the number of words with three or more syllables, calculate the square root, and add three to the square root. This number is the SMOG readability level, which is the estimated grade level one must have to read the document. A SMOG formula calculator is also available free on the Internet. The Gunning FOG Index determines readability by taking the average number of words per sentence plus the number of words that have three or more syllables in a 100-word passage and then multiplying that number by 0.4 (Friedman & Hoffman-Goetz, 2006; Walsh & Volsko, 2008). The Fry formula assesses readability by calculating the

average number of sentences and syllables from three different 100-word passages and then plotting the results on the Fry graph (Doak et al., 1996; Friedman & Hoffman-Goetz, 2006).

Table 3

Readability Instruments for Assessing Written Healthcare Materials

Instrument	Method	Interpretation	Administration	Formula
SMOG (McLaughlin, 1969)	Total number of words that have three or more syllables in 10 sentences in a row at the beginning, middle, and end of the document for a total of 30 sentences	Estimated reading grade level	Manual/ Internet	$3 + \text{square root of polysyllable count}$
Gunning FOG (Friedman & Hoffman-Goetz, 2006; Walsh & Volsko, 2008)	Average number of words per sentence plus the number of polysyllabic words in 100 consecutive words	Number of formal years of education needed to read written materials	Manual	$0.4 * [(\text{number of words} / \text{number of sentences}) + \text{number of polysyllabic words}]$
Fry Formula (Doak et al., 1996; Friedman & Hoffman-Goetz, 2006)	Average number of sentences and average number of syllables from three 100 word passages plotted on the Fry Graph	Estimated reading grade level	Manual	
F-K Formula (Friedman & Hoffman-Goetz, 2006; Walsh & Volsko, 2008)	Number of words per sentence and number of syllables per word in three 100 word passages	Estimated reading grade level	Manual/ Microsoft Word	$(0.39 * sl) + (11.8 * spw) - 15.59$

Table 3 (continued)

Instrument	Method	Interpretation	Administration	Formula
FRE Formula (Flesch, 1948; Friedman & Hoffman-Goetz, 2006)	The number of words per sentence and number of syllables per word in three 100 word passages.	Score between 0 (very difficult) to 100 (very easy)	Manual/ Microsoft Word	$206.835 - (0.846 * wl) - (1.015 * sl)$

Note. SMOG, Simple Measure of Gobbledygook; FOG, Frequency of Gobbledygook; F-K, Flesch-Kincaid; FRE, Flesch Reading Ease; sl, average words per sentence; spw, average syllables per word; wl, number of syllables per 100 words.

The FRE and F-K readability formulas are available as part of the Microsoft Word package using the “spelling and grammar” option. These can easily and quickly estimate the reading level of written materials. However, caution should be used when interpreting as the FRE and F-K can underestimate the reading grade level when compared to other readability assessments (Friedman & Hoffman-Goetz, 2006).

Patient Education Delivery Methods

Written patient education materials are primary sources of information that patients can repeatedly refer to for reminders and reinforcement of medical instructions and information; however, written materials are not a sufficient replacement for the oral communication that must take place between patients and their healthcare provider. Patients with low literacy often rely on oral explanations of medical information and instructions and report difficulty in understanding those explanations given by their health care provider (Baker et al., 1996).

Use of medical jargon (technical medical terminology) can create communication barriers between patients and their healthcare providers. In a study using audiotape recordings of patient-physician encounters, Castro et al. (2007) found that 81% of those encounters included at least one unclarified medical jargon term with an average of 4

unclarified medical jargon terms per encounter occurring almost once every five minutes. Medical jargon was used while assessing symptoms (10%), delivering test results (24%), providing health education (29%), and making recommendations (37%). The researchers suggested using the teach-back method to elicit patient understanding.

Schwartzberg, Cowett, VanGeest, and Wolf (2007) used a convenience sample of 356 healthcare professionals attending health literacy/health communication continuing education sessions at 12 different state and national conferences to explore the communication techniques used with patients with low health literacy. The most commonly used communication techniques were using simple language and avoiding medical jargon (94.7%), handing out printed materials (70.3%), speaking more slowly (67.3%), and reading aloud instructions (59.1%); however, less than 40% reported using the teach-back method. Of the communication methods used, the most perceived effective strategies were using simple language and avoiding medical jargon (96.1%), asking if the patient would like the family member to be in the discussion (92.9%), using teach-back technique (92.8%), and speaking more slowly (90.9%). The researchers recommended that healthcare professionals seek educational opportunities on understanding low health literacy, its impact on the delivery of healthcare, and effective strategies in addressing patients with low health literacy.

For delivery methods, it is suggested to present information according to the patient's priorities; deliver information most important first; always use simple language; use a teach-back or show me method; use open-ended questions; (Bass, 2005; Joint Commission, 2007; Parker, 2000; Schwartzberg et al., 2007); limit instructional sessions to 15 to 20 minutes (Winslow, 2001); and present only two to three concepts and check

for understanding (Joint Commission, 2007; Schwartzberg et al., 2007). Additional suggested strategies for older adults include (John, 1988; Hayes, 1998; Van Wynen, 2001):

1. Use a friendly, quiet and comfortable environment with good lighting.
2. Recognize experience with self-care and high motivation for health.
3. Use slow, clear, concise, and verbal delivery of information.
4. Use short, organized presentations with concise summaries.
5. Use easy to read, large print, specific written material to reinforce the verbal information.
6. Use reinforcement.
7. Use praise and rewards.

Regardless of age, all learners learn best when new information is connected to prior knowledge and experiences. Adults learn best when information is relevant to their situation and when they understand why and how to use the information. Providing a variety of patient education delivery formats can improve patients' ability to receive and understand important information. Good structured visual methods can reinforce the verbal delivery method. Austin-Well, Zimmerman, and McDougall (2003) found that adults aged 65 years and older preferred PowerPoint presentations more than flip chart and overhead presentations combined. Good PowerPoint presentations can address visual, auditory and attention problems identified in older adults by using bold colors and graphics, large font size, and animation features. Using effective strategies will increase the success of delivering relevant and sensitive information that is vital to process of improving patient health outcomes. In addition, the education and training of healthcare

professionals to address low health literacy is crucial to the success of implementing the use of effective strategies.

Professional Education and Development in Health Literacy

Limited resources and educational programs exist to aid healthcare professionals in addressing the issues of low health literacy. It is recommended to begin the educational process by defining the concept of health literacy, describing the scope of the problem and the association between low health literacy and poor health outcomes, and emphasizing that low health literacy affects everyone regardless of age, gender, race, socioeconomic status, or educational attainment (Kripalani & Weiss, 2006).

Several techniques can be incorporated into the existing curricula without causing the need to develop isolated courses to teach students how to address issues of low health literacy. Most respiratory therapy curricula include the use of case studies to develop critical thinking skills. The use of patient case scenarios can provide a good method of having students practice how to communicate a diagnosis, treatment regimen, diagnostic or therapeutic procedures, and informed consent to a patient using recommended communication strategies. The use of trigger videos is another method of engaging students on proper communication techniques. Trigger videos consist of a clinician-patient encounter in which the clinician demonstrates poor communication skills. Students are instructed to view the video tape and then critique the encounter and provide recommendations on how to improve the communication process (Kripalani & Weiss, 2006). Another technique to allow students to practice communication skills is the use of role play in which one student plays the clinician, another plays the patient, and the third student provides feedback as an observer.

A more advanced concept that can bring the patient-clinician encounter even closer to a real life situation is the use of a standardized patient who has been trained to play the role of a patient with low health literacy. The student-standardized patient encounter can be videotaped and then reviewed by the faculty member with the student to provide constructive feedback, identify opportunities to use the teach-back method, model alternate methods to provide patient education, and develop specific areas for improvement (Kripalani, Jacobson, et al., 2006). To aid healthcare educators in providing student education and training on health literacy, standardized patient case studies are available that include standardized patient training materials, case-base teaching methods, educational objectives, and evaluation standards for measuring outcomes (Howley et al., 2008). A list of selected resources and educational programs are located in Appendix H.

Summary and Planned Research

Low health literacy is associated with less disease knowledge, improper management of chronic diseases (e.g. Williams, Baker, Parker, et al., 1998), improper use of medications and medication devices (e.g. Williams, Baker, Honig, et al., 1998), higher use of emergency care (e.g. Baker et al., 2004), less use of preventive health services (e.g. Scott et al., 2002), higher hospitalizations rates, higher mortality rates (e.g. Baker et al., 2002), and higher health care costs (e.g. Weiss & Palmer, 2004). Recommended strategies are available to help provide a universal approach to reduce the affects of inadequate health literacy and improve patient communication (Weiss, 2007). However, it is not known if respiratory therapists are using these recommended strategies to address low health literacy. Respiratory therapists provide health care information to patients in a

variety of settings; therefore, it is vital that respiratory therapists are prepared to meet the challenges presented by patients with inadequate health literacy.

The intent of the researcher was to examine the health literacy knowledge level and experience of respiratory therapists in addressing inadequate health literacy.

Substantial evidence exists for the prevalence and consequences of inadequate health literacy that result in overall poorer health outcomes (DeWalt et al., 2004; Paasche-Orlow et al., 2004). However, it is not known about respiratory therapists' awareness of the prevalence and consequences of inadequate health literacy and what strategies are being used to reduce its effects. This research study will bring awareness to the negative impact that inadequate health literacy has on patient care and gather baseline information about the current knowledge and practices of addressing inadequate health literacy. This first step is necessary within the respiratory therapy arena to move forward in developing effective educational programs on strategies and resources that will assist respiratory therapists in their efforts to provide effective patient communication in a variety of settings.

CHAPTER 3: METHODOLOGY

Health literacy has emerged as an ever-present factor in healthcare delivery and health outcomes. Healthcare professionals are often not prepared to meet the challenges that those patients with inadequate health literacy present. Current efforts to raise awareness and provide strategies for addressing inadequate health literacy are mostly directed toward physicians, nurses, and pharmacists. Respiratory therapists provide a wide range of patient services in a variety of settings and should be included in initiatives that bring awareness to the impact of inadequate health literacy. This chapter will describe the participants, instrumentation, procedures, and data analyses to be used in conducting this study.

The purpose of the research was to assess the current state of practice and knowledge of health literacy among licensed respiratory therapists currently working in North Carolina. In addition, the researcher sought to determine if a relationship exists between health literacy knowledge and experience. The study investigated the following questions:

1. What do respiratory therapists understand in regards to health literacy?
2. What are the practices of respiratory therapists in addressing inadequate health literacy?
3. Is there a relationship between the health literacy knowledge and practices of respiratory therapists?

Participants and Setting

The target population for this research study was licensed respiratory therapists working in North Carolina in a variety of settings including acute care hospitals, long-term acute care hospitals (LTACHs), home healthcare and durable medical equipment (DME) companies, rehabilitation facilities, physician offices, education, management, and research. A list of licensed respiratory therapists was obtained from the North Carolina Respiratory Care Board (NCRCB) with permission to use the email contact information for this research study (see Appendix A). Respiratory therapists must obtain and maintain a license to practice respiratory therapy in the state of North Carolina. The mandatory licensure ensures a minimum standard of competency by requiring annual continuing education and protects the public from individuals without proper education and training from engaging in the practice of respiratory therapy.

Participants and Sample Selection

There are approximately 3,700 active respiratory therapists licensed to practice in North Carolina (North Carolina Health Professions Data Systems [NC HPDS], 2008). The majority of respiratory therapists work in acute care hospitals (84%), followed by home health care (9.6%), LTACH and rehabilitation (3.4%), and education and research (1.0%) (Dyson, 2004). The average age of respiratory therapists in North Carolina is 42 years old with females accounting for the majority of the workforce (65%). This demographic data is consistent with the data from the 2005 AARC Human Resource Study. However, only approximately 15% of respiratory therapists in North Carolina hold at least baccalaureate degree when compared to the national average of approximately 45% (Dubbs, 2006; Dyson, 2004). Race and ethnicity data were not available for

respiratory therapists in North Carolina, but national data indicated that approximately 86% of respiratory therapists were identified as Caucasian.

All respiratory therapists with available email addresses, provided by the NCRCB, were surveyed. The number of potential participants was approximately 3,650. Respiratory therapists are required to renew their license annually and provide updated contact information. However, the NCRCB uses individual rolling renewal dates for each licensed granted; therefore, the list may not reflect recent changes.

Setting

The participants in this research study are considered residents of North Carolina. There are 100 counties in North Carolina with an estimated population of approximately 9 million people (NC HPDS, 2008). The majority of the estimated population resides in urban areas (69%) and is predominately white (74%). Approximately 71% of the respiratory therapists work in urban counties and in counties with a major medical center (Dyson, 2004; NC HPDS, 2008). In 2004, there were 3.8 respiratory therapists per 10,000 population in North Carolina (NC HPDS, 2006) with 16 counties having only one or no licensed respiratory therapists reporting a primary practice location (NC HPDS, 2008). The heaviest concentration of counties without a licensed respiratory therapist was in the eastern region of the state.

Instrumentation

The Health Literacy Knowledge and Experience Survey (HL-KES) was used to collect data for this research study. Permission was obtained to use and modify the HL-KES instrument through email correspondence (see Appendix B). The original HL-KES was developed for the use in a previous study to assess health literacy knowledge and

experiences of senior level baccalaureate nursing students (Cormier, 2006). The original HL-KES consists of three parts that include a multiple-choice knowledge section, a 4-point rating scale experience section, and a demographic information section. The following information will provide evidence of reliability and validity of the results obtained from the original HL-KES instrument (Pyrszak & Bruce, 2005).

Health Literacy Knowledge and Experience Survey Instrument

Cormier (2006) used five content experts to establish content validity of the original HL-KES. The expert panel included a nationally recognized physician in the field of health literacy, a professor of internal medicine and public health, and three doctoral prepared registered nurses with expertise in public health, nursing education, and health literacy. A pilot study was conducted with junior-level baccalaureate nursing students to examine readability, understanding of directions, and time required for participants to complete the survey.

Health literacy knowledge. Part I of the original HL-KES consisted of 29 multiple-choice items designed to assess health literacy knowledge. Cormier (2006) developed five content areas and the items were divided into the following: 1) guidelines for presenting written materials, 2) basic facts on health literacy 3) health literacy screening, 4) consequences associated with health literacy, and 5) evaluating effectiveness of health care information. Item analysis revealed that the item difficulty ranged from .15 to .88 and item discrimination ranged from .00 to .50. Items with low or negative discrimination indices were retained based on the value judgment and a high content validity rating (Cormier, 2006). A content validity index rating of .98 was reported across all items indicating a 98% agreement among the expert panel.

Since the HL-KES was originally created for the nursing profession, modifications to the multiple-choice items were necessary to adapt the survey instrument for the respiratory therapy profession. Revisions to the original HL-KES were made based on the review of the literature, its application to respiratory therapy, items with weak difficulty and discrimination indices, and stem and response option construction. Revisions to the original HL-KES multiple-choice items were done under the direction of an educational psychologist with content expertise in the field of health literacy who is the Director of Curriculum and Evaluation in a large healthcare system in North Carolina. In addition, the researcher used published guidelines for revising and developing the multiple-choice items (Haladyna, 2004).

First, two items in the basic facts content area were deleted and replaced with items addressing prevalence of the low health literacy and patient recall of health information. Second, one item was deleted in the consequences content area and replaced with an item addressing patients' health care experiences and one item regarding proper use of medications. Third, two items addressing formal health literacy screening tools were deleted and replaced with one item addressing the amount of time needed to screen for low health literacy. Fourth, three items were deleted in the guidelines for patient information content area and only minor modifications to the stems and options of the remaining items were performed. Finally, one item was deleted in the evaluation of interventions content area and replaced with an item specific to respiratory therapy. Another multiple choice item was added along with the two check-all-that-apply items that required the participants to evaluate oral communication and written materials. While the original HL-KES instrument only included three levels of Bloom's Taxonomy

(knowledge, comprehension, and application), it was determined that the addition of items that required evaluation would be appropriate since this is highest taxonomic level and requires the use of all the cognitive processes (Osterlind, 1998).

Health literacy experience. Part II of the original HL-KES consisted of nine items designed to obtain information related to the experiences of participants in activities related to health literacy evaluation and presentation of health care information (Cormier, 2006). Each item was evaluated on a 4-point rating scale to indicate the frequency of participating in these activities: 1 = never; 2 = sometimes; 3 = frequently; 4 = always. Cormier (2006) reported internal consistency for the nine-item health literacy experience scale as good (Cronbach's $\alpha = .82$). An exploratory factor analysis was performed using principal component analysis with varimax rotation to determine if the items formed any sub-constructs (Cormier, 2006). Two factors were identified that accounted for 57.2% of the variance with eigenvalues greater than 1.0 and was confirmed by the scree test. The first factor was related to *core health literacy experiences* and the second factor was related to *technology health literacy experiences*. Factor loadings revealed that six items correlated with core health literacy experiences and the remaining three items correlated technology health literacy experiences. One item was added to this section to determine the use of health literacy resources available on the Internet, which increased the number of items from 9 to 10.

Participant demographic information. Part III of the original HL-KES was used to collect participant demographic data. Changes to the demographic information were made to reflect information specific to the respiratory therapy profession and the required information for data analyses related to gender, age, education, credentials, experience,

and area of practice. This data was used to describe the participants in this research study and to allow for generalization of the results to the larger respiratory therapy population. Since substantial modifications were made to the original HL-KES instrument, the name was changed to *Revised HL-KES* to indicate those changes. The Revised HL-KES is located in Appendix C. The original HL-KES is included in Appendix D.

Procedures

Data collection and analyses were designed to address the three research questions of interest in this research study. Before data collection began, a protocol application was completed and submitted for approval from the Institutional Review Board (IRB) at the University of North Carolina at Charlotte. The IRB application included a description of the study purpose, design, methods, and procedures; investigator information; duration of the study and duration of participation; description of how confidentiality will be protected and maintained; and risks and benefits of participation. Participation in the research study was voluntary and participants could withdrawal at any time. Raw data was stored on a password protected computer in a locked office. Access to raw data was restricted to the researcher and dissertation committee. Documentation of IRB approval is located in Appendix E.

Data Collection

Data collection took place in spring of 2009. The Revised HL-KES self-administered instrument was administered to collect responses by using SurveyShare™ web-based program, a commercially available web-based tool. The web-based survey tool provided the capability to collect data and be transferred into spreadsheet or statistical software. The researcher developed an email invitation for recruitment of

participants by describing the purpose of the study, participation contributions, provide a thank you for their time and consideration, and a link to the instrument (see Appendix F). Informed consent was included at the beginning of the instrument prior to accessing the items (see Appendix G). In addition, participants were eligible to enter a drawing to win one of three iPod Shuffles by participating in the health literacy assessment. These elements are consistent with Dillman's (2007) recommendation to support group values, show positive regard, and tangible incentives.

The first contact was an email invitation sent via personalized email by the researcher with instructions and access information once the health literacy instrument was activated. The second contact was a thank you note sent via email thanking participants for their time and participation and also encouraging those who have not participated in the health literacy assessment to consider completing it.

Data Analyses

Data entry was conducted using Excel and imported into SPSS and LISREL for data analyses. The data for this study was analyzed using appropriate descriptive statistics to describe the respondents.

Revised HL-KES reliability and validity. Evidence to support the reliability and validity of the scores obtained from the Revised HL-KES instrument was gathered by numerous methods. Item analysis was conducted to examine item difficulty and item discrimination indices. An item difficulty index close to 0.5 is desirable to better differentiate among participants (Kline, 2005); however, this is limited to items measuring achievement rather than proficiency (Osterlind, 2006). Point-biserial coefficient of correlation is a common method of indicating item discrimination.

Osterlind (2006) suggested that a positive point-biserial coefficient of correlation for a correct response is an indication of a good item and typically ranges 0.2 to 0.5.

A confirmatory factor analysis (CFA) was conducted to test the hypothesized factor model for health literacy experiences based on the previous exploratory factor analysis conducted by Cormier (2006). Since *a priori*-specified theoretical model existed, a CFA was used in this study to provide further evidence of validity of the hypothesized measurement model (Schumacker & Lomax, 2004). Structural equation modeling was used for the CFA in which a graphical model and summary analysis was produced to illustrate how the sample data fit the hypothesized model. Maximum likelihood estimation procedures were used to estimate all parameters. Several model fit indices were evaluated to determine model fit that included root-mean-square error of approximation ($RMSEA < 0.05$), comparative fit index ($CFI > 0.95$), normative fit index ($NFI > 0.95$), and goodness-of-fit index ($GFI > 0.95$) (Shumacker & Lomax, 2004; Tabachnick & Fidell, 2007).

The hypothesized model is presented in Figure 1. Ellipses represent latent variables and the rectangles represent observed variables. The lines connecting the latent variables to the measured variables indicate the hypothesized direct effect.

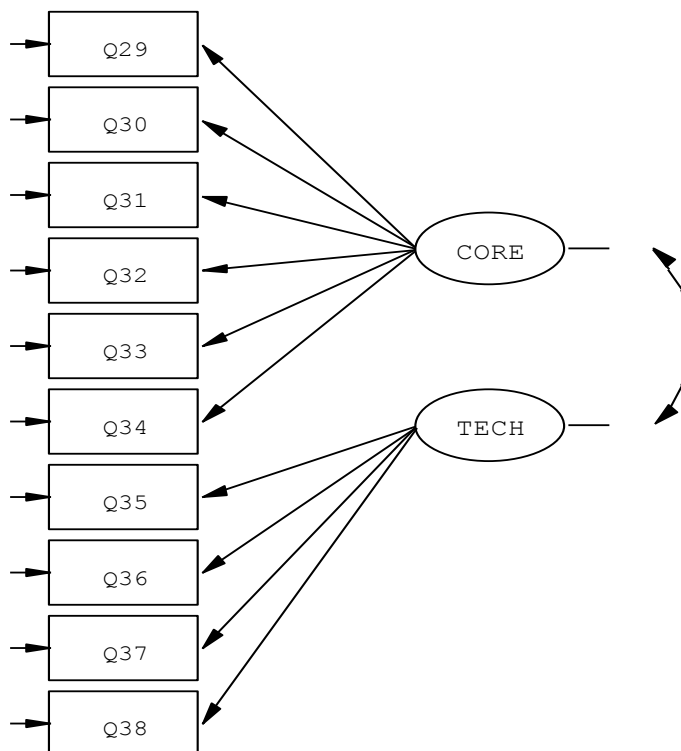


Figure 1. Conceptual hypothesized model of health literacy experiences. Latent variables are shown in ellipses and observed variables are shown in rectangles. Q29 = emphasis of health literacy in the respiratory therapy curriculum; Q30 = use of health literacy screening tools; Q31 = evaluation of reading level for written healthcare materials; Q32 = evaluation of cultural appropriateness of healthcare materials; Q33 = evaluation of illustrations in written healthcare materials; Q34 = use of written materials to provide healthcare information; Q35 = use of audiotapes to provide healthcare information; Q36 = use of videotapes to provide healthcare information; Q37 = use of computer software to provide healthcare information; Q38 = use of the Internet to obtain health literacy information; Core = Core Health Literacy Experiences; Tech = Technical Health literacy Experiences.

The six items measuring core health literacy experiences included: 1) emphasis of health literacy in the respiratory therapy curriculum, 2) use of health literacy screening tools, 3) evaluation of reading level for written healthcare materials, 4) evaluation of cultural appropriateness of healthcare materials, 5) evaluation of illustrations in written healthcare materials, and 6) use of written materials to provide healthcare information.

The four items measuring technical health literacy experiences included: 1) use of

audiotapes to provide healthcare information, 2) use of videotapes to provide healthcare information, 3) use of computer software to provide healthcare information, and 4) use of the Internet to obtain health literacy information.

Research question one. The researcher sought to answer, what do respiratory therapists understand in regards to health literacy? Part I of the Revised HL-KES was used to assess health literacy knowledge of participants using 26 multiple-choice items and two check-all-that-apply items. Analysis of the research question was conducted using descriptive statistics including frequencies, percentages, means, and standard deviations of the HL-KES scores from all participants.

An analysis of correct and incorrect responses was conducted within the five content areas identified by Cormier (2006) that included (a) basic facts on health literacy, (b) consequences associated with low health literacy, (c) health literacy screening, (d) guidelines for presenting healthcare information, and (e) evaluation of health literacy interventions.

Research question two. The researcher sought to answer, what are the practices of respiratory therapists in addressing inadequate health literacy? Part II of the Revised HL-KES was used to assess the current practices of respiratory therapists in addressing inadequate health literacy. Participants were asked to complete 10 items by describing how often they engage in activities related to health literacy evaluation and presentation of healthcare information by using the following 4-point rating scale: 1 = never; 2 = sometimes; 3 = frequently; 4 = always. The data from the responses were treated as continuous data and analyzed using descriptive statistics that included percentages, means, and standard deviations for each item.

Research question three. The researcher sought to answer, is there a relationship between the health literacy knowledge and practices of respiratory therapists? Cormier (2006) reported that health literacy knowledge had a significant but weak and negative relationship to the health literacy experience construct and the two sub-constructs (core health literacy and technical health literacy) in a student nursing population. It was determined that the relationship between the five content areas of health literacy knowledge (independent variables) and two sub-constructs of health literacy experiences (dependent variables) should receive further examination in the respiratory therapy population.

Anticipated Ethical Issues

The researcher anticipated that the proposed research study posed no more than minimal risk that participants would encounter in their daily lives. No deception was involved and participation was voluntary. Since the first part of the Revised HL-KES instrument was a multiple-choice knowledge assessment, some risk of creating a feeling of inadequacy or anxiety among participants was expected. To minimize this social cost, the participants were informed that their responses are strictly anonymous and cannot be linked to their contact information (Dillman, 2007). Participants could withdrawal from the study at any time. Respiratory therapists solicited for participation received an email notice explaining the purpose and extent of the research study. Consent was implied with completion of the survey. IRB approval was obtained prior to collecting data.

All survey responses are confidential and were not linked to participant information. Data was pooled and reported in aggregate form with no individual identified in the reporting data. Access to the data was restricted to the researcher and

dissertation committee. The raw data was secured on a password-protected computer located in a locked office.

Summary

The intent of the researcher was to assess health literacy knowledge and practices among licensed respiratory therapists in North Carolina. The research questions of interest addressed the level of health literacy knowledge and practices used to address inadequate health literacy and the relationship between health literacy knowledge and current practices of respiratory therapists. Participants were selected from a population of active respiratory therapists licensed in North Carolina.

An exploratory survey research method was used to obtain data for this research study. The self-administered Revised HL-KES instrument was administered to obtain data on health literacy knowledge, experience, and demographics. The survey was administered via web-based tool. Data analysis procedures relevant to each question were used to describe the data and determine statistical significance. Chapter four describes the data analysis procedures and presents the results in the form of narrative text and tables where appropriate.

CHAPTER 4: RESULTS

The purpose of the research was to assess the current state of practice and knowledge of health literacy among licensed respiratory therapists currently working in North Carolina. In addition, the researcher sought to determine if a relationship exists between health literacy knowledge and experience. Data collection took place between April and May of 2009.

Revised HL-KES Reliability and Validity Evidence

Item difficulty and discrimination indices are presented in Table 4. Item analysis revealed that the item difficulty ranged from 0.12 to 0.96. One item had an item difficulty index less than 0.20 and 12 items had an item difficulty index greater than 0.80. Item discrimination was calculated using the point-biserial coefficient of correlation and revealed positive coefficients for all items. Only two items had one distracter each that were not endorsed by the study participants. The first item had a correct response rate of approximately 91% with only a very small percentage divided between two distracters, while the second item had the majority of the responses divided between the correct response and one distracter. Ten items were identified with an item discrimination index of less than 0.2, which included two items with a difficulty index of greater than 0.80 and one item with a difficulty index of less than 0.20.

Table 4

Item Analysis for Correct Responses to Items in Part I of the Revised HL-KES

Item	Item Difficulty Index ^a	Item Discrimination Index ^b
1. Low health literacy levels are most prevalent among which of the following age groups?	.56	.17
2. Which of the following is the best predictor of health status?	.34	.09
3. What is the recommended reading grade level for written healthcare information?	.42	.35
4. Patients with low health literacy experience which of the following?	.84	.31
5. For which of the following groups is low health literacy most prevalent?	.39	.11
6. What is the estimated number of American adults who have difficulty reading and understanding health information?	.28	.19
7. According to recent research, what percent of patients report forgetting what the doctor told them as soon as he or she has left the room?	.34	.22
8. Which of the following questions would provide the health care professional with the best estimate of reading skills of the patient?	.52	.31
9. Approximately what percent of patients never told their healthcare providers of their low health literacy because they felt ashamed or embarrassed?	.39	.10
10. The research on health literacy indicates which of the following?	.67	.40

Table 4 (continued)

Item	Item Difficulty Index ^a	Item Discrimination Index ^b
11. How do many patients respond to experiencing difficulty understanding health information?	.89	.45
12. What is the strongest advantage of conducting health literacy screenings?	.82	.17
13. Which of the following health behaviors are common among patients with low health literacy skills?	.70	.25
14. Which of the following approaches would be the most practical to ensure that patients with low health literacy receive understandable health information?	.67	.11
15. Which of the following is true with regards to written healthcare information?	.90	.36
16. When providing verbal information about asthma medication, how many concepts should be presented at a time?	.91	.29
17. Approximately what percent of patients with asthma who have low health literacy do not use their metered-dose inhaler correctly?	.46	.29
18. If a patient is unable to perform a proper inhaler technique following instruction, what should the healthcare professional do?	.92	.11
19. Which of the following should the healthcare professional consider when caring for patients with low health literacy levels? Patients with low health literacy...	.91	.13
20. What is the best way to ensure that a smoking cessation brochure is culturally appropriate?	.59	.39

Table 4 (continued)

Item	Item Difficulty Index ^a	Item Discrimination Index ^b
21. Which of the following would be considered the first step in developing written healthcare information?	.68	.28
22. Written healthcare information provided to a patient related to a specific disease should include which of the following?	.59	.36
23. Which of the following approaches to patient education provides the most opportunity for the patient to actively engage in learning?	.42	.16
24. What is the most effective way for the healthcare professional to determine how well a patient with low health literacy skills understands healthcare information?	.80	.37
25. Which of the following would be the most effective approach to assess patient understanding of medical information?	.80	.32
26. What is the minimum time required to assess your patient's health literacy?	.12	.10
27. Given the above patient education material for "What is COPD?" please select from the following that best describe this brochure excerpt. (check all that apply)		
Frequent use of technical or medical words	.68	.49
Large font with serifs (e.g. Times New Roman)	.37	.20
Frequent use of words with 3 or more syllables	.44	.47

Table 4 (continued)

Item	Item Difficulty Index ^a	Item Discrimination Index ^b
28. Given the above patient education material for “Signs and symptoms of COPD?” please select from the following that best describe this brochure excerpt. (check all that apply)		
Written at or below 6 th grade reading level	.61	.35
Short and simple sentence structures	.86	.21
Bulleted lists to draw attention to key concepts	.76	.30
Short paragraphs	.70	.30

Note. Item Analysis was performed using an Internet application from <http://www.hr-software.net/cgi/ItemAnalysis.cgi>.

^a Item difficulty indicates percent of participants endorsing the correct response.

^b Item discrimination index was calculated using point-biserial coefficient of correlation.

A confirmatory factor analysis (CFA) was conducted to test the hypothesized factor model for health literacy experiences identified by Cormier (2006). Prior to data analysis, the data were examined for accuracy, missing values, outliers, linearity, and normality using SPSS 15.0 and LISREL 8.80. Missing values were found in six of the items and for a total of 11 cases (3%). The cases with missing data were removed from the study leaving 324 remaining cases for analysis. Visual examination of normality probability plots indicated the assumption of linearity was satisfied. Univariate outliers were detected in six of the items. Mahalanobis distance analysis revealed three multivariate outliers ($p < 0.001$). The tests for skewness and kurtosis indicated no serious departures for univariate normality as they were found to be less than 1.0, except for one item (Q35: use of audiotapes) that revealed the data were positively skewed (1.28) and

leptokurtic (1.37). Test of multivariate normality for skewness and kurtosis revealed evidence that multivariate normality was violated ($p < 0.001$). Removal of the univariate and multivariate outliers did not improve multivariate normality and since 11 cases were removed due to missing data (3%), the researcher retained the outliers for final analysis. Table 5 presents correlations, means, and standard deviations for the observable variables.

Table 5

Correlations, Means, and Standard Deviations for Health Literacy Experience Variables

Variable	q29	q30	q31	q32	q33	q34	q35	q36	q37	q38
q29	--									
q30	.26**	--								
q31	.21**	.32**	--							
q32	.17**	.36**	.54**	--						
q33	.19**	.40**	.65**	.68**	--					
q34	.14*	.35**	.44**	.46**	.56**	--				
q35	.12*	.25**	.14*	.26**	.17**	.35**	--			
q36	.11*	.18**	.23**	.40**	.30**	.46**	.70**	--		
q37	.10	.15**	.31**	.36**	.33**	.38**	.40**	.50**	--	
q38	.20**	.32**	.22**	.26**	.26**	.24**	.30**	.29**	.30**	--
<i>M</i>	1.82	1.89	2.04	2.00	2.33	2.39	1.52	1.69	1.70	1.60
<i>SD</i>	.79	.91	1.03	.94	.97	.83	.71	.73	.81	.76

Note. Q29 = emphasis of health literacy in the respiratory therapy curriculum; Q30 = use of health literacy screening tools; Q31 = evaluation of reading level for written healthcare materials; Q32 = evaluation of cultural appropriateness of healthcare materials; Q33 = evaluation of illustrations in written healthcare materials; Q34 = use of written materials to provide healthcare information; Q35 = use of audiotapes to provide healthcare information; Q36 = use of videotapes to provide healthcare information; Q37 = use of computer software to provide healthcare information; Q38 = use of the Internet to obtain health literacy information.

* $p < 0.05$. ** $p < 0.01$.

For model identification and estimation, the hypothesized model indicated that there were 21 parameters to be estimated for a total of 55 data points; therefore, the hypothesized model contained more pieces of information than parameters to be estimated indicating an over-identified model that was tested with 34 degrees of freedom (Tabachnick & Fidell, 2007). Because there was evidence that multivariate normality was violated, the hypothesized model was estimated using robust maximum likelihood estimation and tested with Satorra-Bentler scaled chi-square (χ^2).

The hypothesized model was tested and only marginal support was found for the hypothesized model, Satorra-Bentler scaled χ^2 (34, $N = 324$) = 121.94, $p < 0.001$, RMSEA = 0.089, NFI = 0.93, CFI = 0.95, GFI = 0.92. Post-hoc model modifications were performed in order to obtain a better fitting model. Six residual covariances were estimated between evaluation of illustrations in written healthcare materials (Q33) and evaluation of reading level for written healthcare materials (Q31), use of written materials to provide healthcare information (Q34) and evaluation of cultural appropriateness of healthcare materials (Q32), use of the Internet to obtain health literacy information (Q38) and use of health literacy screening tools (Q30), use of audiotapes to provide healthcare information (Q35) and use of health literacy screening tools (Q30), use of the Internet to obtain health literacy information (Q38) and use of videotapes to provide healthcare information (Q36), and use of health literacy screening tools (Q30) and emphasis of health literacy in the respiratory therapy curriculum (Q29).

The model was improved with the estimation of the six residual covariances, Satorra-Bentler $\chi^2_{\text{difference}}$ (6, $N = 324$) = 27.04, $p < 0.001$. The final model fit the data reasonably well, Satorra-Bentler scaled χ^2 (28, $N = 324$) = 57.3, $p < 0.001$, RMSEA =

0.057, NFI = 0.97, CFI = 0.98, GFI = 0.96. Since post hoc modifications were performed, a bivariate correlation was calculated between the hypothesized model and final model parameter estimates, $r(21) = 0.88$, $p < 0.001$ indicating that parameter estimates were slightly changed following modification. Figure 2 illustrates the final model with modifications. The correlated error variances are not included in the figure.

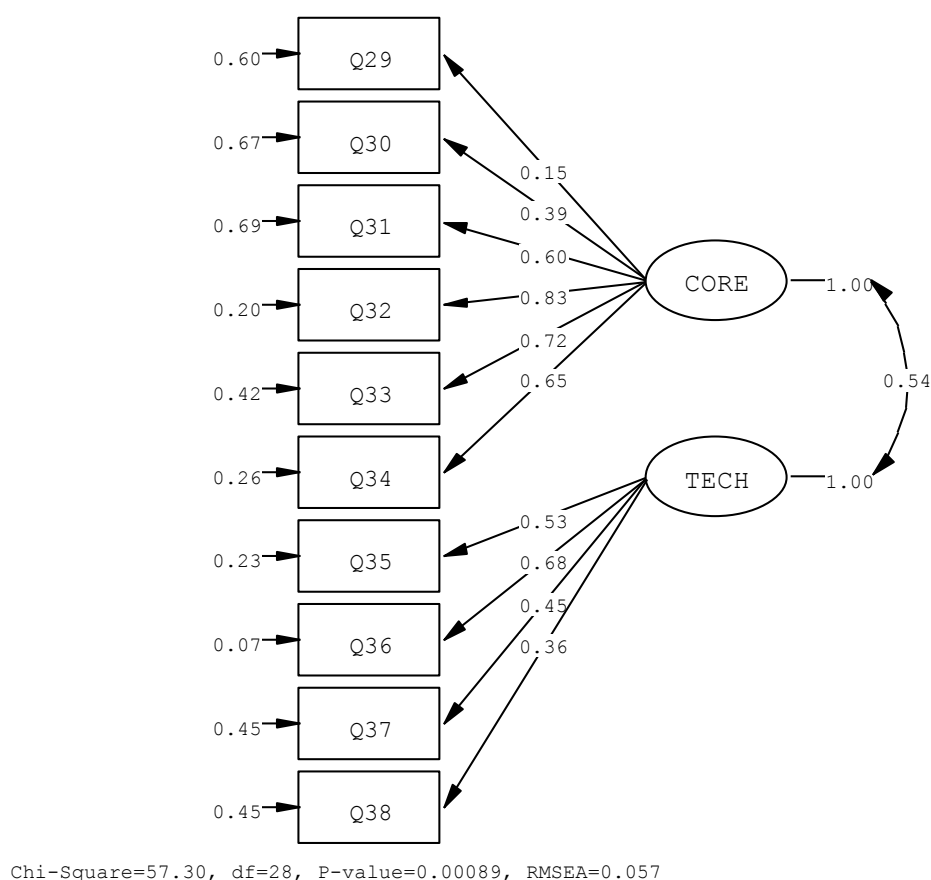


Figure 2. Standardized coefficients for the final modified measurement model. Latent variables are shown in ellipses and observed variables are shown in rectangles. Q29 = emphasis of health literacy in the respiratory therapy curriculum; Q30 = use of health literacy screening tools; Q31 = evaluation of reading level for written healthcare materials; Q32 = evaluation of cultural appropriateness of healthcare materials; Q33 = evaluation of illustrations in written healthcare materials; Q34 = use of written materials to provide healthcare information; Q35 = use of audiotapes to provide healthcare information; Q36 = use of videotapes to provide healthcare information; Q37 = use of computer software to provide healthcare information; Q38 = use of the Internet to obtain health literacy information; Core = Core Health Literacy Experiences; Tech = Technical Health literacy Experiences.

Participant Demographic Information

Approximately 3,650 licensed respiratory therapists were sent an initial invitation email and follow-up email to request participation in the study with a total of 335 respondents completing the Revised HL-KES through the SurveyShare™ web-based program. There were approximately 600 emails returned as undeliverable for a total participation rate of 11.0%. Part III of the Revised HL-KES provided participant demographic information that included age, gender, education, credentials, years of experience, primary practice area, and region of employment (Appendix C).

Of the respiratory therapists who participated in the survey, the average age was 45.16 ($SD = 9.56$) with an age range of 23 to 67 years of age. The majority of the participants were female (57.3%), held the RRT credential (91.8%), and had an associate's degree (57.3%) or bachelor's degree (26.9%). The majority of participants reported having more than 20 years of respiratory therapy experience (44.8%), practiced in acute and critical care areas (64.2%), and worked in the central region of North Carolina (46.3%). Table 6 provides an overview of participant demographic information.

Table 6

Frequencies and Percentages for Participant Demographic Characteristics (N = 335)

Demographics	<i>n</i>	%
Gender		
Male	143	42.7
Female	192	57.3
Education		
Certificate/Diploma	12	3.6
Associate's Degree	192	57.3
Bachelor's Degree	90	26.9
Master's Degree	36	10.7

Table 6 (continued)

Demographics	<i>n</i>	%
Doctoral Degree	5	1.5
Credentials		
CRT	25	7.5
RRT	215	64.2
CRT/Specialty Credential	5	1.5
RRT/Specialty Credential	89	26.6
Years of Experience		
< 1 year	1	0.3
1-5 years	49	14.6
6-10 years	38	11.3
11-20 years	97	29.0
> 20 years	150	44.8
Practice Area		
Adult Acute/Critical Care	161	48.1
Pediatric Acute/Critical Care	54	16.1
Long-Term Care Facility	7	2.1
Rehabilitation Facility	13	3.9
Home Care/DME	19	5.7
Management, Education, Research	78	23.3
Region		
West	45	13.4
Northwest	26	7.8
Central	155	46.3
Northeast	19	5.7
Southeast	89	26.6

Health Literacy Knowledge

Research question one. The researcher sought to answer, what do respiratory therapists understand in regards to health literacy? Part I of the Revised HL-KES was used to assess health literacy knowledge of respiratory therapists using 26 multiple-choice items and two check-all-that-apply items. Multiple choice items were scored 1 point for each correct response and 0 for incorrect responses. The check-all-that-apply

items were scored 0.5 points for each correct response and 0 for incorrect responses. Each response option for the check-all-that-apply items was treated as a separate item for purposes of analysis. Missing data were scored the same as incorrect responses. The lowest possible overall raw score was 0 with the highest possible score of 29.5. The health literacy knowledge overall raw scores for participants ranged from 6.0 to 25.5 with a mean of 18.13 ($SD = 3.43$). Calculated percent scores for participants ranged from 20.3% to 86.4% with a mean of 61.5% ($SD = 11.6\%$). Figure 3 illustrates the distribution of participant percent scores for the health literacy knowledge. Internal consistency for health literacy knowledge was fair with Cronbach's *alpha* of 0.58. The tests for skewness (-0.60) and kurtosis (0.31) indicated no serious departures for normality as they were found to be less than 1.0 (Huck, 2004).

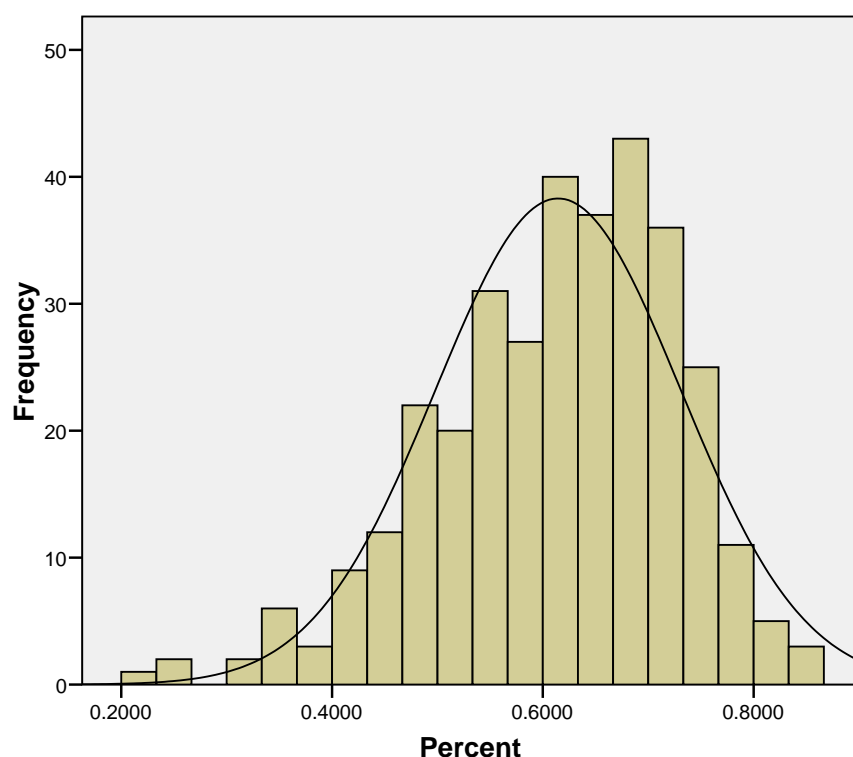


Figure 3. Histogram illustrating the distribution of participant percent scores for the health literacy knowledge with a norm curve superimposed.

Based on previous research by Cormier (2006), the Revised HL-KES items were grouped into five content areas that included: 1) basic facts on health literacy, 2) consequences associated with health literacy, 3) health literacy screening, 4) guidelines for presenting patient information, and 5) evaluating effectiveness of health care information. Table 7 presents the percentage of correct and incorrect responses for Part I of the Revised HL-KES within each content area.

First, knowledge about basic facts on health literacy was measured using six multiple-choice items regarding prevalence and indicators of low health literacy. The majority of the participants (66.9%) were aware that individuals read three to five grade levels lower than the last year of school completed and 55.5% responded correctly by indicating that low health literacy is most prevalent among individuals age 65 years and older. However, the majority of the participants were not aware that health literacy is considered a better predictor of health status with 50.7% choosing socioeconomic status while only 34.3% chose health literacy. Over 60% of the participants did not know that approximately 90 million American adults are affected by low health literacy that reaches across all ethnic groups.

Second, five multiple-choice items were used to assess knowledge regarding the consequences associated with low health literacy. Approximately 84% of the participants were aware that individuals with low health literacy have fewer treatment options when compared to those with adequate health literacy. An overwhelming number of participants (90.7%) recognized that individuals with low health literacy may experience difficulty applying healthcare information to their health situation and 70.4% of the participants were aware that individuals with low health literacy participate less in

preventive healthcare services when compared to those individuals with adequate health literacy. However, approximately 37% of the participants thought that less than half of the patients with low health literacy do not use their MDI correctly.

Third, health literacy screening is an important aspect in identifying individuals who may be at risk for low health literacy. There are instruments available to conduct formal screening but there are also several informal methods that can be used to help identify individuals at risk for low health literacy. Four multiple-choice items were used to measure knowledge of health literacy screening. The majority of the participants (88.7%) were aware that patients with low health literacy would most likely deny having difficulty reading and understanding health information and understood the advantage of conducting health literacy screenings (81.8%). Even though a slight majority of the participants (52.2%) recognized that asking a patient to read a prescription bottle label was an effective method of estimating a patient's reading skills, approximately 27% of the participants identified the last grade completed as a good estimation while nearly 19% would simply ask the patient if he or she had difficulty reading. Only about 12% of the participants were aware that health literacy screening can be done in as little as one minute.

Fourth, eight multiple-choice items were used to measure the knowledge regarding guidelines for presenting patient education information. Approximately 90% of the participants were aware that picture illustrations can improve patient understanding of written materials and that the presentation of health information should be limited to only 2 to 3 concepts at a time. Nearly 68% of the participants indicated that communication with all patients should be conducted using simple language and avoiding medical jargon.

The majority of the participants (67.8%) recognized that the first step in developing written materials was to identify what the target audience needs to know while approximately 59% would include members from the community to ensure cultural appropriateness in the design of a brochure. However, only approximately 42% of the participants knew that the recommended reading grade level for written materials is 5th to 6th grade or considered small group, question-answer sessions as a method to actively engage patients in the learning process.

Finally, evaluation of health literacy interventions was assessed using three multiple-choice items and two check-all-that-apply items. The two check-all-that-apply items were brochure experts designed to require participants to apply recommended guidelines for written healthcare materials. Over 90% of the participants recognized that it is important to re-phrase instructions and ask the patient to repeat the demonstration if they do not understand the first time, while approximately 80% identified the *teach-back* method as an effective way to assess patient understanding of healthcare information. The majority of the participants were able to determine that the brochure excerpts were developed using the appropriate grade reading level ($\leq 6^{\text{th}}$ grade), short and simple sentence structures, limited use of technical/medical jargon, bulleted lists to emphasize key points, and short paragraphs. However, participants had difficulty identifying the use of large font with serifs for the text for both brochure excerpts and use the of polysyllable words in the “What is COPD” excerpt.

Table 7

Sample Size and Percentages of Correct and Incorrect Responses to Items in Part I of the Revised HL-KES Five Content Areas

Item	Response Option %							N
	a	b	c	d	e	f	g	
Basic Facts on Health Literacy								
1. Low health literacy levels are most prevalent among which of the following age groups?	28.1	2.7	13.4	55.5				334
2. Which of the following is the best predictor of health status?	50.7	34.3	0.3	14.6				335
5. For which of the following groups is low health literacy most prevalent?	20.0	40.6	0.6	38.8				335
6. What is the estimated number of American adults who have difficulty reading and understanding health information?	7.2	49.0	27.8	16.1				335
7. According to recent research, what percent of patients report forgetting what the doctor told them as soon as he or she has left the room?	11.0	55.2	33.7	0.0				335
10. The research on health literacy indicates which of the following?	24.8	66.9	5.7	1.8				332

Table 7 (continued)

Item	Response Option %							<i>N</i>
	a	b	c	d	e	f	g	
Consequences of Health Literacy								
4. Patients with low health literacy experience which of the following?	9.0	4.2	2.1	84.5				334
9. Approximately what percent of patients never told their healthcare providers of their low health literacy because they felt ashamed or embarrassed?	2.7	23.6	39.4	33.7				333
13. Which of the following health behaviors are common among patients with low health literacy skills?	70.4	16.4	11.0	2.1				335
17. Approximately what percent of patients with asthma who have low health literacy do not use their metered-dose inhaler correctly?	4.2	36.4	46.3	12.8				334
19. Which of the following should the healthcare professional consider when caring for patients with low health literacy levels? Patients with low health literacy...	7.5	1.2	90.7	0.6				335

Table 7 (continued)

Item	Response Option %							N
	a	b	c	d	e	f	g	
Health Literacy Screening								
8. Which of the following questions would provide the health care professional with the best estimate of reading skills of the patient?	26.9	18.5	52.2	2.4				335
11. How do many patients respond to experiencing difficulty understanding health information?	1.5	88.7	8.7	1.2				335
12. What is the strongest advantage of conducting health literacy screenings?	4.5	81.8	11.0	2.4				334
26. What is the minimum time required to assess your patient’s health literacy?	11.6	38.5	21.5	28.4				335
Guidelines for Patient Education Information								
3. What is the recommended reading grade level for written healthcare information?	14.6	41.8	30.7	12.5				334

Table 7 (continued)

Item	Response Option %							<i>N</i>
	a	b	c	d	e	f	g	
14. Which of the following approaches would be the most practical to ensure that patients with low health literacy receive understandable health information?	3.3	67.5	11.9	16.7				333
15. Which of the following is true with regards to written healthcare information?	3.6	89.6	3.3	3.6				335
16. When providing verbal information about asthma medication, how many concepts should be presented at a time?	90.7	8.7	0.6	0.0				335
20. What is the best way to ensure that a smoking cessation brochure is culturally appropriate?	12.2	16.7	12.2	58.8				335
21. Which of the following would be considered the first step in developing written healthcare information?	2.4	23.3	67.8	6.3				334
22. Written healthcare information provided to a patient related to a specific disease should include which of the following?	59.4	33.4	5.4	1.2				333

Table 7 (continued)

Item	Response Option %							<i>N</i>
	a	b	c	d	e	f	g	
23. Which of the following approaches to patient education provides the most opportunity for the patient to actively engage in learning?	29.9	5.4	42.1	21.2				330
Evaluation of Interventions								
18. If a patient is unable to perform a proper inhaler technique following instruction, what should the healthcare professional do?	0.3	92.2	5.7	1.8				335
24. What is the most effective way for the healthcare professional to determine how well a patient with low health literacy skills understands healthcare information?	2.7	4.8	79.7	12.5				334
25. Which of the following would be the most effective approach to assess patient understanding of medical information?	1.2	9.3	7.5	80.0				328

Table 7 (continued)

Item	Response Option %							<i>N</i>
	a	b	c	d	e	f	g	
27. Given the above patient education material for “What is COPD?” please select from the following that best describe this brochure excerpt. (check all that apply)	14.6	35.2	68.1	37.0	5.0	43.6	46.0	335
28. Given the above patient education material for “Signs and symptoms of COPD?” please select from the following that best describe this brochure excerpt. (check all that apply)	61.5	85.7	4.2	43.0	75.8	6.9	69.6	335

The results suggest that knowledge gaps exist for respiratory therapists participating in this study in the five content areas of health literacy knowledge, especially in basic facts on health literacy (42.8%) and health literacy screening (58.6%) in which the overall scores were the lowest. Study participants scored highest in the content area of evaluation of interventions (72.9%). Table 8 provides the overall percent of correct responses for each of the five content areas of health literacy knowledge.

Table 8

Overall Percent of Correct Responses for the Revised Health Literacy Knowledge Five Content Areas

Content Area	Overall Percent of Correct Responses
Basic Facts of Health Literacy	42.8%
Consequences of Health Literacy	66.3%
Health Literacy Screening	58.6%
Guidelines for Patient Education Information	64.7%
Evaluation of Interventions	72.9%

Health Literacy Experience

Research question two. The researcher sought to answer, what are the practices of respiratory therapists in addressing inadequate health literacy? Part II of the Revised HL-KES was used to assess the current practices of respiratory therapists in addressing inadequate health literacy. Participants were asked complete to 10 items by describing how often they engage in activities related to health literacy evaluation and presentation of health care information by using the following 4-point rating scale: 1 = never; 2 = sometimes; 3 = frequently; 4 = always.

Using the scale established by Cormier (2006), the following ranges were used to interpret the mean health literacy experience scores: 1.0 – 1.49 = never; 1.50 – 2.49 = sometimes; 2.50 – 3.49 = frequently; 3.50 – 4.0 = always. The mean score of the ten items ranged from 1.52 to 2.39 with a mean of 1.90 ($SD = 0.53$) with good internal consistency (Cronbach's $\alpha = 0.83$). The results suggest that participants engage in activities related to health literacy evaluation and presentation of health care information

only “sometimes.” The item with the lowest mean was the use of audiotapes to provide healthcare information ($M = 1.52$, $SD = 0.71$) and the highest mean was the use of written materials to provide healthcare information ($M = 2.39$, $SD = 0.83$). Based on a previous study by Cormier (2006), two sub-constructs were identified and categorized as core health literacy experiences and technical health literacy experiences. These sub-constructs were used and measured in the current study. The results revealed a mean score for core health literacy experiences at 2.08 ($SD = 0.64$) while the mean score for technical health literacy experiences was lower at 1.63 ($SD = 0.57$). Internal consistency for core and technical health literacy experiences was good with Cronbach’s *alpha* of 0.80 and 0.73, respectively. Table 9 provides descriptive statistics for responses in Part II of the Revised HL-KES.

Table 9

Percentages and Sample Size for Responses to Items in Part II of the Revised HL-KES within the Core and Technical Health Literacy Experiences Sub-Constructs

Item	%				N
	Never	Sometimes	Frequently	Always	
Core					
29. How frequently was health literacy emphasized in your respiratory therapy education program?	37.9	46.9	11.3	3.9	335
30. How often do you use a health literacy screening tool to assess the health literacy skills of a patient?	41.5	34.9	17.9	5.7	335

Table 9 (continued)

Item	%				<i>N</i>
	Never	Sometimes	Frequently	Always	
31. How often do you evaluate the reading level of written healthcare materials before using them for patient teaching?	36.7	34.3	15.2	12.8	332
32. How often do you evaluate the cultural appropriateness of healthcare materials, including written handouts, videos, and audiotapes, before using them for patient teaching?	35.8	36.7	19.1	8.4	335
33. How often do you evaluate the use of illustrations in written healthcare materials before using them for patient teaching?	21.2	37.9	26.6	14.0	334
34. How often do you use written materials to provide healthcare information to an individual or community group?	12.5	45.7	31.6	9.6	333
Technical					
35. How often do you use audiotapes to provide healthcare information to an individual or community group?	57.6	33.1	6.9	1.8	333
36. How often do you use videotapes to provide healthcare information to an individual or community group?	44.2	43.9	9.6	2.1	334

Table 9 (continued)

Item	%				N
	Never	Sometimes	Frequently	Always	
37. How often do you use computer software (e.g. PowerPoint or interactive CDs) to provide healthcare information to an individual or community group?	49.6	32.2	16.1	2.1	335
38. How often do you use internet resources, such as www.askme3.org and www.healthliteracy.com , to obtain health literacy information?	56.1	28.7	13.4	1.2	333

Relationship between Health Literacy Knowledge and Experience

Research question three. The researcher sought to answer, is there a relationship between the health literacy knowledge and health literacy practices (experiences) of respiratory therapists? The independent variables were derived from the raw scores for each of the five content areas from Part I of the HL-KES (health literacy basic facts, health literacy consequences, health literacy screening, guidelines for presenting patient information, and evaluating effectiveness of health care information). The dependent variables were derived from the mean scores for the two sub-constructs from Part II of the HL-KES (core and technical health literacy experiences).

Standard multiple regression analyses were performed using SPSS (regression) and LISREL (path analysis) to determine the relationship between health literacy knowledge and health literacy experiences. Prior to the analysis, assumptions were tested by visual examination of normal probability plots and scatter diagrams of residuals versus

predicted residuals. No obvious violations of normality, linearity, or homoscedasticity were found. Six univariate outliers ($> 3 SD$ from the mean) were detected and two of those outliers were identified as multivariate outliers ($p < 0.001$) using Mahalanobis distance analysis. The outliers were removed from the data set prior to analysis (2%). Results of the variance inflation factor (all less than 2.0) indicated the assumption of collinearity was not violated. Table 10 presents descriptive statistics for correlations, means, and standard deviations of the study variables.

Table 10

Correlations, Means, and Standard Deviations for Revised HL-KES Study Variables

Variable	1	2	3	4	5	6	7
1. mcBasics	--						
2. mcConseq	.10	--					
3. mcScreen	.07	.21**	--				
4. mcPtEd	.10	.21**	.21**	--			
5. mcEval	.13*	.14**	.21**	.25**	--		
6. CoreAve	.13*	-.01	.00	-.14*	-.04	--	
7. TechAve	.00	.08	.07	-.06	-.10	.45**	--
<i>M</i>	2.57	3.30	2.36	5.2	4.77	2.07	1.61
<i>SD</i>	1.22	1.00	0.80	1.50	1.17	.61	.53

Note. 1 = basic facts, 2 = consequences of health literacy, 3 = health literacy screening, 4 = guidelines for patient information, 5 = evaluating effectiveness, 6 = core health literacy experiences, 7 = technical health literacy experiences.

* $p < 0.05$. ** $p < 0.01$.

Regression analysis revealed a significant but small relationship between health literacy knowledge and core health literacy experiences, $R^2 = 0.04$ ($N = 329$, $p = 0.01$). In

terms of individual relationships between the independent variables and core health literacy experiences, basic facts on health literacy ($t = 2.56, p = 0.01$) and guidelines for presenting patient information ($t = -2.69, p < 0.01$) each revealed a significant relationship with core health literacy experiences. However, no significant relationship was found between health literacy knowledge and technical health literacy experiences, $R^2 = 0.03$ ($N = 329, p = 0.10$). The standardized regression coefficients are reported in Table 11. Figure 4 illustrates the health literacy experience regression path analysis.

Table 11

Multiple Regression Analysis Summary for Health Literacy Experiences

	Standardized Coefficients (<i>B</i>)	
	Core Health Literacy	Technical Health Literacy
1. mcBasics	.14*	.01
2. mcConseq	.00	.09
3. mcScreen	.03	.09
4. mcPted	-.16**	-.07
5. mcEval	-.03	-.11

Note. Core: $R^2 = 0.04$ ($N = 329$). Tech: $R^2 = 0.03$ ($N = 329$). 1 = basic facts, 2 = consequences of health literacy, 3 = health literacy screening, 4 = guidelines for patient information, 5 = evaluating effectiveness.

* $p < 0.05$. ** $p < 0.01$

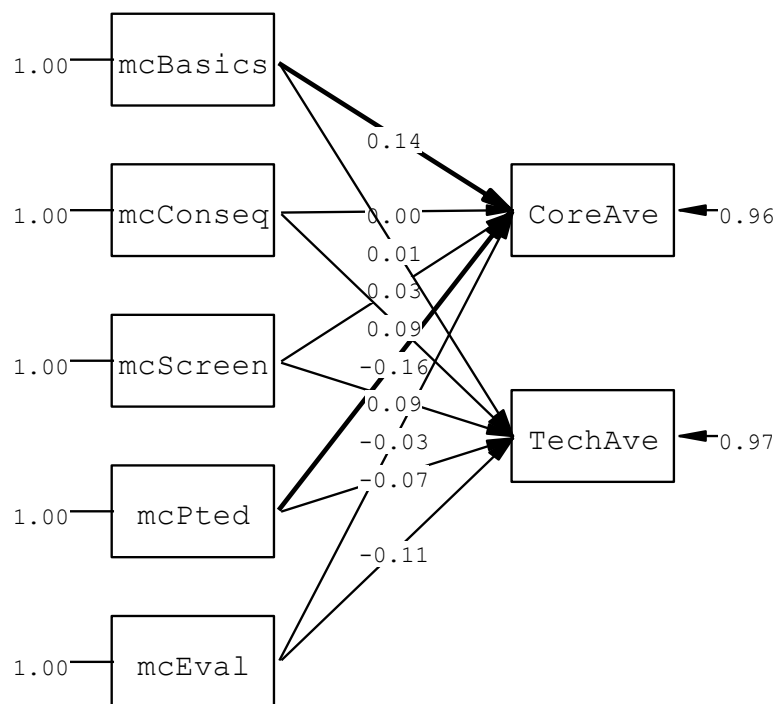


Figure 4. Health literacy knowledge and experience regression path analysis. Bolded lines indicate significant regression coefficients. mcBasics = basic facts on health literacy, mcConseq = consequences associated with health literacy, mcScreen = health literacy screening, mcPted = guidelines for presenting patient information, mcEval = evaluating effectiveness of health care information, CoreAve = core health literacy experiences, TechAve = technical health literacy experiences.

Summary

Approximately 3,650 licensed respiratory therapists were invited to participate in this study with a total of 335 respondents completing the HL-KES for a return rate of 11.0%. Participants in this study appear to resemble respiratory therapists nationwide with regards to demographic characteristics. The results suggest that knowledge gaps exist in the five content areas of health literacy knowledge, especially in basic facts on health literacy and health literacy screening. Regarding health literacy experiences, data analysis revealed that participants engage in activities related to health literacy evaluation and presentation of health care information only “sometimes.” A confirmatory factor

analysis (CFA) was conducted to test the hypothesized factor model presented by Cormier (2006). Initial model testing indicated only marginal support for the hypothesized model. However, after post-hoc model modifications were performed between six residual covariances, the model appeared to fit the data reasonably well. Regression analysis revealed a significant but small relationship between health literacy knowledge and core health literacy experiences, specifically for basic facts on health literacy and guidelines for patient education materials. No significant relationship was found between health literacy knowledge and technical health literacy experiences.

CHAPTER FIVE: SUMMARY AND DISCUSSION

Low health literacy is a silent epidemic that impairs the ability of patients to properly access, understand, and use essential health care related information and services. Health literacy is defined as “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” (Ratzan & Parker, 2000). Low health literacy does not discriminate; it affects everyone regardless of age, race, socioeconomic status, or educational attainment. Low health literacy affects over 90 million American adults with the elderly and minorities having the greatest risk from the consequences associated with low health literacy.

Low health literacy is associated with less disease knowledge (Williams, Baker, Parker, et al., 1998), improper use of medications and medication devices (Williams, Baker, Honig, et al, 1998), higher use of emergency care (Mancuso & Rincon, 2006), improper management of chronic diseases, less use of preventive health services (DeWalt et al, 2004), higher rates of hospitalizations (Paasche-Orlow et al, 2005), and higher health care costs (Weiss & Palmer, 2004). The AMA, IOM, Joint Commission, and the Surgeon General have weighed in on the importance of addressing low health literacy by releasing recommendations indicating the need to raise awareness of the impact of low health literacy and to provide healthcare professionals education to better recognize and address health literacy needs.

Healthcare professionals are often not prepared to meet the challenges that patients with inadequate health literacy present (Nielson-Bohlman et al., 2004). Current efforts to raise awareness and provide strategies for addressing inadequate health literacy are mostly directed toward physicians, nurses, and pharmacists (Brown et al., 2004). Respiratory therapists provide healthcare information to patients in a variety of settings; therefore, it is vital that respiratory therapists are included in initiatives that bring awareness to the negative impact of inadequate health literacy and to prepare them to meet the challenges presented by patients with inadequate health literacy.

Study Purpose

The purpose of the research was to assess the current state of practice and knowledge of health literacy among licensed respiratory therapists currently working in North Carolina. In addition, the researcher sought to determine if a relationship exists between health literacy knowledge and experience. The study investigated the following questions:

1. What do respiratory therapists understand in regards to health literacy?
2. What is the current state of practice of respiratory therapists in addressing inadequate health literacy?
3. Is there a relationship between the current state of practice and health literacy knowledge of respiratory therapists?

Procedures

The target population for this research study was licensed respiratory therapists working in North Carolina in a variety of settings including acute care hospitals, LTACHs and rehabilitation facilities, home healthcare and DME companies, physician

offices, education, management, and research. Data collection took place between April and May of 2009. Approximately 3,650 respiratory therapists with available email addresses, provided by the NCRCB, were surveyed. A total of 335 respondents completed the HL-KES through the SurveyShare™ web-based program.

The HL-KES instrument was chosen for use in this research study (Cormier, 2006). Permission was obtained to use and modify the instrument. Modifications were based on review of the literature and application to the respiratory therapy profession. The Revised HL-KES is composed of three sections that included health literacy knowledge, health literacy experiences, and demographic information. For health literacy knowledge, five content areas were used to assess knowledge that included: 1) basic facts on health literacy, 2) consequences associated with health literacy, 3) health literacy screening, 4) guidelines for presenting patient information, and 5) evaluating effectiveness of health care information. Health literacy experiences were measured in terms of core and technical health literacy experiences (see Appendix C).

An exploratory survey research method was used to obtain data for this research study. Data analysis procedures relevant to each question were used to describe the data and determine statistical significance. First, evidence to support the reliability and validity of the scores obtained from the Revised HL-KES instrument was gathered by numerous methods. Item analysis was conducted to examine item difficulty and item discrimination indices. In addition, a confirmatory factor analysis (CFA) was conducted to test the hypothesized factor model presented by Cormier (2006). Second, descriptive statistics were used to describe participants in the study. Third, analysis of health literacy knowledge was conducted using descriptive statistics including frequencies, percentages,

means, and standard deviations of participant scores. Fourth, health literacy experiences were analyzed using descriptive statistics that included percentages, means, and standard deviations for each item. Finally, to determine the relationship between health literacy knowledge and experience, regression analysis was used. The researcher used SPSS 15.0 and Lisrel 8.80 statistical programs for data analyses.

Summary and Discussion of Findings

Revised HL-KES Reliability and Validity

Evidence of reliability and validity of results obtained from an instrument is the foundation for item development. For the multiple-choice and check-all-that-apply items in the health literacy knowledge part, item analysis was conducted to examine item difficulty and item discrimination indices. Kehoe (1995) recommended that items with a discrimination index of less than 0.15 should be reviewed for modification. Based on this recommendation, seven items in the knowledge section of the Revised HL-KES were identified for review and future modifications. The five content areas for health literacy knowledge are representative of the major categories in the health literacy literature. However, beyond face validity, no additional evidence of validity is provided for the health literacy knowledge content areas as defined constructs. Further investigation in establishing evidence for validity should be attempted according to the *Standards for Educational and Psychological Testing* (Haladyna, 2004).

A confirmatory factor analysis (CFA) was conducted to test the hypothesized factor model for health literacy experiences presented by Cormier (2006). The hypothesized model was tested and only marginal support was found. Post-hoc model modifications were performed in an attempt to obtain a better fitting model. Following

the modifications, the fit indices indicate that the final model fit the data reasonably well (Satorra-Bentler scaled chi-square $[28, N = 324] = 57.3, p < 0.001$, RMSEA = 0.057, NFI = 0.97, CFI = 0.98, GFI = 0.96). Using CFA, the researcher was able to provide some further evidence of theoretical validity for the results obtained from the Revised HL-KES instrument. However, since post-hoc modifications were necessary to obtain a better fitting model and the bivariate correlation calculation between the hypothesized model and final model parameter estimates was less than 0.90, it is suggested that further study be conducted with new sample data to test the model (Tabachnick & Fidell, 2007).

Participant Demographic Information.

Demographic information was obtained in order to describe the study participants and to allow for generalization of the results to similar populations that included age, gender, credentials, education, years of experience, area of practice, and regional location of employment. The findings indicated that the majority of respiratory therapists who participated in the survey were female with an average age of 45.2 years. The majority of the participants held the RRT credential with an associate's degree. In addition, the majority of participants reported having more than 20 years of respiratory therapy experience, practiced in acute and critical care areas, and worked in the central region of North Carolina. When compared to the latest data from the 2005 AARC Human Resources study (Dubbs, 2006), the study participants' demographic characteristics are approximately within 5% of respiratory therapists nationwide, with the exception of educational attainment and area of practice.

The study participants accounted for 64.2% of respiratory therapists working in acute and critical care areas when compared to respiratory therapists nationwide (74.1%).

The AARC Human Resources study provided a category for employment venues that included education but not research and management; whereas, this study provided an option that combined management, research, and education into one category, which may account for the difference. In addition, the participants in this study reported a higher percentage of associate degrees (57.3%) when compared to respiratory therapists nationwide (44.4%). North Carolina ranks approximately sixth in the country with the number of respiratory therapy programs; however, until recently, it was the only state without a bachelor's degree in respiratory therapy when compared to the other states with more programs. In 2004, only approximately 15% of respiratory therapists in North Carolina reported holding a bachelor's degree when compared to respiratory therapists nationwide at 32.5% (Dubbs, 2006; Dyson, 2004). Study participants reported that approximately 27% held a bachelor's degree, which is lower than the national percentage but considerably higher than what was reported in 2004 for North Carolina. Since the study participants appear to be similar to respiratory therapists nationwide with regards to their demographic characteristics, this may allow for generalization of the results to the larger respiratory therapy population.

Health Literacy Knowledge

Research question one. The researcher sought to answer, what do respiratory therapists understand in regards to health literacy? Part I of the Revised HL-KES was used to assess health literacy knowledge of respiratory therapists using 26 multiple-choice items and two check-all-that-apply items. The mean health literacy knowledge score was 18.13 ($SD = 3.43$) out of a possible 29.5 points with a calculated mean percent score of 61.5% ($SD = 11.6\%$). These results are consistent with previous research

indicating that nursing students' mean health literacy score was 17.76 ($SD = 3.93$) out of a possible 29 points (Cormier, 2006). The findings suggest that even though respiratory therapists who participated in the study have some degree of health literacy, knowledge gaps exist. To better identify where the knowledge gaps exist, the Revised HL-KES items were grouped into five content areas that included: 1) basic facts on health literacy, 2) consequences associated with health literacy, 3) health literacy screening, 4) guidelines for presenting patient information, and 5) evaluating effectiveness of health care information (Cormier, 2006).

Assessment of participant knowledge regarding basic facts on health literacy indicated that the majority of the participants were aware that individuals read three to five grade levels lower than the last year of school but one quarter of the participants would estimate reading skills based on educational attainment. The majority of the participants were not aware that health literacy is a better predictor of health status nor did they know that approximately 90 million American adults are affected by low health literacy that reaches across all ethnic groups.

Participants were more familiar with consequences associated with low health literacy. The majority of the participants were aware that individuals with low health literacy have fewer treatment options, may experience difficulty applying healthcare information to their health situation and participate less in preventive healthcare services when compared to those individuals with adequate health literacy. However, over one-third did not realize that the majority of patients with low health literacy do not use their MDI correctly. Paasche-Orlow and colleagues (2005) reported that low health literacy was associated with higher hospitalization rates for asthma, less asthma knowledge, and

improper MDI technique; however, low health literacy was not associated with difficulty learning or retaining discharge regimen instructions and proper MDI technique following a *teach-to-goal* educational intervention. Respiratory therapists play a vital role in educating patients about medication regimens and proper MDI technique. It is essential for respiratory therapists to recognize that low health literacy may be a factor in why patients may not follow discharge instructions or do not use medications properly, and therefore, provide educational interventions to improve patient understanding.

Responses to items regarding guidelines for health literacy screening indicated that the majority of participants recognized that patients with low health literacy would most likely deny having difficulty reading and understanding health information and the importance of conducting health literacy screening to identify those patients with low health literacy. In addition, participants believed that asking a patient to read a prescription bottle label was an effective method of estimating a patient's reading skills but did not make the connection that health literacy screening can be done in as little as one minute. Nearly 50% of the participants perceived health literacy screening would take at least eight minutes. This may suggest that the participants believe health literacy screening to be a process involving formal instruments instead of being able to use simple techniques such as having the patient read his or her prescription label or single question screens identified in recent research (Chew et al., 2008; Wallace et al., 2006). The use of informal techniques can be done routinely in busy clinical settings to aid respiratory therapists in identifying patients who may potentially have difficulty understanding healthcare information while reducing the risk of inducing a feeling of embarrassment or shame associated with low health literacy (Chew et al., 2008).

Participant knowledge regarding guidelines for presenting patient education information indicated that the majority of the participants thought that communication with all patients should be conducted using simple language and avoiding medical jargon while limiting the presentation of concepts to only 2 or 3 at a time before checking for understanding. Most of the participants were aware of the importance of picture illustrations to improve patient understanding of written healthcare materials. In a recent study, Schwartzberg and colleagues (2007) reported that the majority of physicians, pharmacists, and nurses perceived using simple language and avoiding medical jargon, presenting 2 to 3 concepts at a time, and picture illustrations as effective communication techniques. In addition, participants recognized that the first step in developing written materials was to identify what the target audience needs to know and the importance of including members from the community to ensure cultural appropriateness in the design of a brochure. To support this finding, researchers recommended that the first step in developing patient education materials is to involve stakeholders (healthcare providers, patients, families, and caregivers) early in the process (Seligman et al., 2007). A little more than half of the participants knew that the recommended reading grade level for written materials is 6th grade and below while approximately 43% indicated that materials written at the 8th grade level and higher would be appropriate. The average reading level of most American adults is at or below the ninth grade level; and for older adults aged 65 years and older and urban minorities, many read at or below the fifth grade level (Doak et al., 1996).

Assessment of knowledge regarding the evaluation of health literacy interventions indicated that an overwhelming number of the participants recognized that it is important

to re-phrase instructions and ask the patient to repeat the demonstration if he or she does not understand the first time, while the majority identified the teach-back method as an effective way to assess patient understanding of healthcare information. This finding is consistent with previous research indicating that the majority of healthcare professionals perceived the teach-back method as an effective communication technique (Schwartzberg et al., 2007). The majority of the participants in this study were able to determine the use of the appropriate grade reading level ($\leq 6^{\text{th}}$ grade), short and simple sentence structures, limited use of technical/medical jargon, bulleted lists to emphasize key points, and short paragraphs. However, participants had difficulty identifying the appropriate use of large font with serifs and limited use of polysyllable words.

Health Literacy Experiences

Research question two. The researcher sought to answer, what are the practices of respiratory therapists in addressing inadequate health literacy? The mean health literacy experience score was 1.90 ($SD = 0.53$), which is lower than the mean score reported for nursing students at a mean score of 2.04 and SD of 0.53 (Cormier, 2006). For the two sub-constructs, core health literacy experiences and technical health literacy experiences, the results revealed mean scores that mirrored those results reported in the study by Cormier. Even though approximately 74% of the study participants reported having more than 10 years of experience in respiratory therapy, the study participants have limited core health literacy experiences in health literacy screening, evaluating readability of written healthcare materials, and evaluating cultural appropriateness of healthcare materials. Furthermore, the study participants have even less technical health literacy

experiences in using alternate approaches of delivering healthcare information that include audiotapes, videotapes, computer software programs, and internet resources.

Relationship between Health Literacy Knowledge and Experiences

Research question three. The researcher sought to answer, is there a relationship between the health literacy knowledge and health literacy practices (experiences) of respiratory therapists? Standard multiple regression analyses were performed using regression and path analysis to determine the relationship between health literacy knowledge (health literacy basic facts, health literacy consequences, health literacy screening, guidelines for presenting patient information, and evaluating effectiveness of health care information) and health literacy experiences (core and technical health literacy experiences).

Regression analysis revealed a significant but small relationship between health literacy knowledge and core health literacy experiences. In terms of individual relationships between the independent variables and core health literacy experiences, results indicated a significant but small positive relationship for basic facts on health literacy and a significant but small negative relationship for guidelines in presenting patient information. However, no significant relationship was found between health literacy knowledge and technical health literacy experiences.

Cormier (2006) reported a low and negative association between health literacy knowledge and experiences indicating that health literacy experiences decrease with increased health literacy knowledge. Even with modifications to the health literacy knowledge items, little association was detected. These findings could suggest that respiratory therapists may be familiar with the term health literacy but lack the necessary

resources and training to adequately assess patients' health literacy levels and implement evidence-based techniques in the clinical setting (Barrett & Puryear, 2006). In addition, it is plausible to consider that the HL-KES instrument should undergo further examination for modifications that may provide a better assessment to uncover potential stronger relationships.

Limitations

The current study has notable limitations that should be considered when interpreting the results. This survey research study took place in North Carolina and was limited to licensed respiratory therapists with available email addresses currently working in a healthcare setting. In addition, this study used a convenience sample with a return rate of only 11%, which makes it subject to the limitations of self-selection and bias. However, since the study participants' demographic characteristics appear to resemble respiratory therapists nationwide, it may improve the ability to generalize the results to the larger respiratory therapy population. Caution should be exercised with regards to the Revised HL-KES instrument. Instrumentation weaknesses were identified in the analyses and additional revisions should be considered prior to its use in any future research.

Implications and Recommendations

The results of this study are consistent with the previous study assessing health literacy knowledge and experience among senior baccalaureate nursing students (Cormier, 2006). The results suggest that, like nursing students, the respiratory therapists who participated in this study have gaps in health literacy knowledge and limited experience in assessing and implementing strategies to address low health literacy among their patients. It cannot be stressed enough the importance of recognizing the negative

impact that low health literacy has on how patients receive and act on healthcare information. Low health literacy is not limited to individuals of minority status, low socioeconomic status, or the elderly. Low health literacy can affect anyone, including the well educated, who may not be familiar with navigating the healthcare system or accustomed to unfamiliar medical and technical jargon used in explaining health conditions (Barrett & Puryear, 2006), especially during times of emotional stress related to a medical condition.

It is the intent of the researcher that this study will serve to define the concept of health literacy as well as its prevalence and the negative impact low health literacy has on patient health outcomes so that the results may aid in developing better educational programs to increase awareness and provide strategies for addressing patients with inadequate health literacy. In addition, the results of this study may contribute new knowledge to the respiratory therapy body of literature on health literacy and potentially serve as a point of reference for future health literacy studies in the respiratory therapy profession.

Since an overwhelming majority of the study participants (85%) indicated that health literacy was emphasized either “never” or only “sometimes” in their respiratory therapy program, perhaps a good starting point would be to evaluate the respiratory therapy curricula to determine how health literacy may be incorporated into the existing content. Kripalani and Weiss (2006) suggested that:

Having set the stage by informing learners about the scope of the problem, the healthcare experiences of patients with low health literacy, and the association between literacy and health outcomes, educators should next empower their

[students] by teaching them how to communicate more clearly with patients (p. 888).

Kripalani and Weiss (2006) go on to suggest that the use of role-play, trigger videos, and standardized patients are effective methods that can be incorporated into the existing curricula without the need of creating isolated courses.

Based on the findings of this study, it is the recommendation of the researcher that the HL-KES instrument be examined for further modifications that may improve the test quality and increase its sensitivity of detecting relationships between health literacy knowledge and experiences. Other areas for future research should include further review by an expert panel for additional evidence of content validity, expanding the assessment to other healthcare professionals, and establishing a possible standard score for assessing health literacy competency among healthcare professionals. In addition, a primary focus of additional research in the respiratory therapy profession should be aimed at examining the relationship between health literacy knowledge and experiences among respiratory therapy students, as they will become the future of the profession and how patient care will be delivered.

REFERENCES

- Aldridge, M.D. (2004). Writing and designing readable patient education materials. *Nephrology Nursing Journal*, 31(4), 373-377
- Adams, K. & Corrigan, J.M. (Eds.). (2003). *Priority Areas for National Action: Transforming Health Care Quality*. Institute of Medicine, Committee on Identifying Priority Areas for Quality Improvement. Washington, DC: National Academy Press. Retrieved on December 31, 2008 from http://www.nap.edu/catalog.php?record_id=10593.
- American Medical Association. (1999). Health Literacy: Report of the Council on Scientific Affairs. Ad Hoc Committee on Health Literacy for the American Council on Scientific Affairs, American Medical Association. (1999). *Journal of American Medical Association*, 281, 552-557.
- Aspden, P., Wolcott, J., Bootman, J.L., & Cronenwett, L.R. (Eds.). (2007). *Preventing Medication Errors: Quality Chasm Series*. Institute of Medicine, Committee on Identifying and Preventing Medication Errors. Washington, DC: National Academy Press. Retrieved on December 28, 2008 from http://www.nap.edu/catalog.php?record_id=11623.
- Austin-Well, V., Zimmerman, T., & McDougall, G. (2003). An optimal delivery format for presentations targeting older adults. *Educational Gerontology*, 29, 493-501.
- Baker, D.W., Gazmararian, J.A., Sudano, J., & Patterson, M. (2000). The association between age and health literacy among elderly persons. *Journal of Gerontology: Social Sciences*, 55B (6), S368-S374.
- Baker, D.W., Gazmararian, J.A., Williams, M.V., Scott, T., Parker, R.M., Green, D., et al. (2002). Functional health literacy and the risk of hospital admission among Medicare managed care enrollees. *American Journal of Public Health*, 92(8), 1278-1283. Retrieved from EBSCOHost Health Source: Nursing/Academic Edition database.
- Baker, D.W., Gazmararian, J.A., Williams, M.V., Scott, T., Parker, R.M., Green, D., et al. (2004). Health literacy and use of outpatient physician services by Medicare managed care enrollees. *Journal of General Internal Medicine*, 19(3), 215-220. doi: 10.1111/j.1525-1497.2004.21130.x
- Baker, D.W., Parker, R.M., Williams, M.V., Clark, W.S. (1998). Health literacy and the risk of hospital admission. *Journal of General Internal Medicine*, 13(12), 791-798. doi:10.1046/j.1525-1497.1998.00242.x

- Baker, D.W., Parker, R.M., Williams, M.V., Clark, W.S., & Nurss, J. (1997). The relationship of patient reading ability to self-reported health and use of health services. *American Journal of Public Health, 87*(6), 1027-1030. Retrieved from EBSCOHost Health Source: Nursing/Academic Edition database.
- Baker, D.W., Parker, R.M., Williams, M.V., Pitkin, K., Parikh, N.S., Coates, W., et al. (1996). The health care experience of patients with low literacy. *Archives of Family Medicine, 5*, 329-334. doi:10.1001/archfami.5.6.329
- Baker, D.W., Williams, M.V., Parker, R.M., Gazmararian, J.A., & Nurss, J. (1999). Development of a brief test to measure functional health literacy. *Patient Education and Counseling, 38* (1), 33-42.
- Baker, D.W., Wolf, M.S., Feinglass, J., Thompson, J.A., Gazmararian, J.A., & Huang, J. (2007). Health literacy and mortality among elderly persons. *Archives of Internal Medicine, 167*(14), 1503-1509. doi:10.1001/archinte.167.14.1503
- Barrett, S.E. & Puryear, J.S. (2006). Health literacy: Improving quality care in primary care settings. *Journal of Health Care for the Poor and Underserved, 17*, 690-697.
- Bass, L. (2005). Health literacy: Implications for teaching the adult patient. *Journal of Infusion Nursing, 28* (1), 15-22.
- Bass, P., Wilson, J., Charles, G., & Barnett, D. (2002). Residents' ability to identify patients with poor literacy skills. *Academic Medicine, 77*, 1039-1041.
- Bass, P., Wilson, J., Griffith, C. (2003). A shortened instrument for literacy screening. *Journal of General Internal Medicine, 18*, 1036-1038.
- Braddock, C., Fihn, S., Levinson, W., Jonsen, A., & Pearlman, R. (1997). How doctors and patient discuss routine clinical decisions: Informed decision making in the outpatient setting. *Journal of General Internal Medicine, 12*(6), 339-345. Doi: 10.1046/j.1525-1497.1997.00057.x.
- Brown, D.R., Ludwig, R., Buck, G.A., Durham, D., Shumard, T., & Graham, S.S. (2004). Health literacy: Universal precaution needed. *Journal of Allied Health, 33*, 150-155.
- Carter-Pokras, O. & Baquet, C. (2002). What is a "health disparity"? *Public Health Reports, 117*(5), 426-434. doi:10.1093/phr/117.5.426
- Castro, C.M., Wilson, C., Wang, F., & Schillinger, D. (2007). Babel babble: Physicians' use of unclarified medical jargon with patients. *American Journal of Health Behavior, 31*(Supplement 1), S85-S95. Retrieved from EBSCOHost Health Source: Nursing/Academic Edition database.

- Center on an Aging Society. (n.d.). Low health literacy skills increase annual health care expenditures by \$73 billion [Fact Sheet]. Retrieved on December 1, 2008 from <http://ihcrp.georgetown.edu/agingsociety/pubhtml/healthlit.html>.
- Chew, L., Bradley, K., & Boyko, E. (2004). Brief questions to identify patients with inadequate health literacy. *Family Medicine*, 36, 588-594.
- Chew, L.D., Griffin, J.M., Partin, M.R., Noorbaloochi, S., Grill, J.P., Snyder, A., et al. (2008). Validation of screening questions for limited health literacy in a large VA outpatient population. *Journal of General Internal Medicine*, 23(5), 561-566. doi:10.1007/s11606-008-0520-5
- Cormier, C.M. (2006). Health literacy: The knowledge and experiences of senior level baccalaureate nursing students. [Doctoral Dissertation]. (UMI No. 3244945)
- Cutilli, C. (2005). Do your patients understand? Determining your patients' health literacy skills. *Orthopaedic Nursing*, 24, 372-377.
- Davis, T., Long, S., Jackson, R., Mayeaux, E., George, R., Murphy, P., et al. (1993). Rapid Estimate of Adult Literacy in Medicine: A shortened screening instrument. *Family Medicine*, 25, 391-395.
- Davis, T.C., Wolf, M.S., Bass, P.F., Middlebrooks, M., Kennen, E., Baker, D.W., et al. (2006). Low literacy impairs comprehension of prescription drug warning labels. *Journal of General Internal Medicine*, 21(8), 847-851.
- Davis, T.C., Wolf, M.S., Bass, P.F., Thompson, J.A., Tilson, H.H., Neuberger, M., et al. (2006). Literacy and misunderstanding of prescription drug labels. *Annals of Internal Medicine*, 145(12), 887-894.
- DeWalt, D.A., Berkman, N.D., Sheridan, S., Lohr, K.N., Pignone, M.P. (2004). Literacy and outcomes: A systematic review of the literature. *Journal of General Internal Medicine*, 19, 1228-1239. doi:10.1111/j.1525-1497.2004.40153.x
- DeWalt, D.A., Boone, R.S., & Pignone, M.P. (2007). Literacy and its relationship with self-efficacy, trust, and participation in medical decision making. *American Journal of Behavioral Health*, 31(Supplement 1), S27-S35. Retrieved from EBSCOHost Health Source: Nursing/Academic Edition database.
- Dillman, D.A. (2007). *Mail and internet survey: The tailored design method*. 2nd ed. Hoboken, NJ: John Wiley & Sons, Inc.
- Doak, C., Doak, L. & Root, J. (1996). *Teaching patients with low literacy skills*. Philadelphia, PA: JB Lippincott CO.

- Dubbs, W. (2006). By the numbers: Results from the AARC's 2005 human resources study. *AARC Times*, 30 (6), 36-43.
- Dyson, S. (2004). The state of allied health in North Carolina. A focus on the respiratory therapy workforce. The Council for Allied Health in North Carolina, Chapel Hill, North Carolina. Retrieved on August 31, 2005 from <http://www.shepscenter.unc.edu/hp/publications/resptherapy04.pdf>.
- Flesch, R. (1948). A new readability yardstick. *Journal of Applied Psychology*, 32(3), 221-233. doi:10.1037/h0057532
- Friedman, D.B. & Hoffman-Goetz, L. (2006). A systematic review of readability and comprehension instruments used for print and web-based cancer information. *Health Education & Behavior*, 33(3), 352-373. doi:10.1177/1090198105277329
- Gazmararian, J., Baker, D., Williams, M., Parker, R., Scott, T., Green, D., et al. (1999). Health literacy among Medicare enrollees in a managed care organization. *Journal of the American Medical Association*, 281, 545-551.
- Gazmararian, J.A., Williams, M.V., Peel, J., & Baker, D.W. (2003). Health literacy and knowledge of chronic disease. *Patient Education and Counseling*, 51, 267-275. doi:10.1016/S0738-3991(02)00239-2
- George, J. Kong, D.C.M., Thoman, R., & Stewart, K. (2005). Factors associated with medication nonadherence in patients with COPD. *Chest*, 128(5), 3198-3204. doi:10.1378/chest.128.5.3198
- Greenberg, D. (2001). A critical look at health literacy. *Adult Basic Education*, 11 (2), 67-79.
- Haladyna, T.M. (2004). *Developing and validating multiple-choice test items*. 3rd edition. Mahwah, NJ: Lawrence Erlbaum Associates.
- Hayes, K. (1998). Randomized trial of geragogy-based medication instruction in the emergency department. *Nursing Research*, 47 (4), 211-218.
- Howard, D.H., Gazmararian, J., & Parker, R.M. (2005). The impact on low health literacy on the medical costs of Medicare managed care enrollees. *The American Journal of Medicine*, 118, 371-377. doi:10.1016/j.amjmed.2005.01.010
- Howley, L., Peterson, C., Barrett, E., Gazewood, J., Wilson, W., Holroyd, S., (2008). *Utilizing Standardized Patients to Enhance Health Literacy Communication Skills*. MedEdPORTAL: <http://services.aamc.org/30/mededportal/servlet/s/segment/mededportal/?subid=1101>

- Huck, S. W. (2004). *Reading statistics and research*. Boston, MA: Allyn & Bacon.
- Ivnik, M. & Jett, M.Y. (2008). Creating written patient education materials. *Chest*, 133(4), 1038-1040. doi:10.1378/chest.07-3040
- John, M. (1988). *Geragogy: A theory for teaching the elderly*. New York: The Hawthorn Press, Inc.
- Joint Commission. (2007). "What Did the Doctor Say?:" Improving Health Literacy to Protect Patient Safety [White Paper]. Retrieved on August 30, 2008 from http://www.JointCommission.org/PublicPolicy/health_literacy.htm.
- Kehoe, J. (1995). Basic item analysis for multiple-choice tests. *Practical Assessment, Research & Evaluation*, 4(10). Retrieved July 24, 2009 from <http://PAREonline.net/getvn.asp?v=4&n=10>.
- Kickbusch, I. (2001). Health literacy: Addressing the health and education divide. *Health Promotion International*, 16(3), 289-297. doi:10.1093/heapro/16.3.289
- Kirsch I., Jungeblut, A., Jenkins, L., & Kolstad, A. (1993). *Adult literacy in America: A first look at the results of the National Literacy Survey (NALS)*. Washington, DC: National Center for Education, U.S. Department of Education.
- Kline, T.J.B. (2005). *Psychological testing: A practical approach to design and evaluation*. Thousand Oaks, CA: Sage Publications, Inc.
- Knowles, M., Holton, E., & Swanson, R. (1998). *The adult learner: The definitive classic in adult education and human resource development*. Houston, TX: Gulf Publishing Company.
- Kripalani, S., Henderson, L.E., Chiu, E.Y., Robertson, R., Kolm, P., & Jacobson, T.A. (2006). Predictors of medication self-management skills in a low literacy population. *Journal of General Internal Medicine*, 21(8), 852-856.
- Kripalani, S., Jacobson, K., Brown, S., Manning, K., Rask, K., & Jacobson, T. (2006). Development and implementation of a health literacy training program for medical students. *Medical Education Online*, 11(13), 1-8. Retrieved on April 1, 2009 from <http://www.med-ed-online.org/pdf/T0000097.pdf>.
- Kripalani, S. & Weiss, B.D. (2006). Teaching about health literacy and clear communication. *Journal of General Internal Medicine*, 21(8), 888-890.

- Kutner, M., Greenburg, E., Jin, Y., & Paulsen, C. The health literacy of American adults: Results from the 2003 National Assessment of Adult Literacy (NCES 2006-483). U.S. Department of Education. Washington, DC: National Center for Education Statistics; 2006. Retrieved on October 3, 2006 from <http://nces.ed.gov/pubs2006/2006483.pdf>.
- Mancuso, C.A. & Rincon, M. (2006a). Impact of health literacy on longitudinal asthma outcomes. *Journal of General Internal Medicine*, 21(8), 813-817.
- Mancuso, C.A. & Rincon, M. (2006b). Asthma patients' assessments of health care and medical decision making: The role of health literacy. *Journal of Asthma*, 43, 41-44. doi:10.1080/02770900500447052
- Maniaci, M.J., Heckman, M.G., Dawson, N.L. (2008). Functional health literacy and understanding discharge medications. *Mayo Clinic Proceedings*, 83(5), 554-558. Retrieved on October 14, 2008 from <http://www.mayoclinicproceedings.com/pastissues.asp>.
- McLaughlin, G.H. (1969). SMOG grading—A new readability formula. *Journal of Reading*, 12, 639-646. Retrieved from [http://www.harrymclaughlin.com/SMOG_Readability_Formula_G._Harry_McLaughlin_\(1969\).pdf](http://www.harrymclaughlin.com/SMOG_Readability_Formula_G._Harry_McLaughlin_(1969).pdf).
- Mika, V., Kelly, P., Price, M., Franquiz, M., & Villarreal, R. (2005). The ABCs of health literacy. *Family & Community Health*, 28, 351-357.
- Nielson-Bohlman, L., Panzer, A.M., & Kindig, D.A. (eds.) (2003). *Health literacy: A prescription to end the confusion*. Committee on Health Literacy. Washington, DC: The National Academies Press.
- North Carolina Health Professions Data Systems. (2006). Respiratory therapists 2004. Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill. Retrieved on January 13, 2008 from http://www.shepscenter.unc.edu/hp/publications/prof_factsheets/2004/RT04.pdf
- North Carolina Health Professions Data Systems. (2008). North Carolina health professions 2007 data book: A report on health care resources in North Carolina. Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.
- North Carolina Institute of Medicine. (2007). Just what did the doctor order? Addressing low health literacy in North Carolina [Issue Brief]. Retrieved on December 1, 2008 from http://www.nciom.org/projects/health_literacy/IssueBrief.pdf.
- Nutbeam, D. (1998). Health promotion glossary. *Health Promotion International*, 13(4), 349-364. doi:10.1093/heapro/13.4.349

- Nutbeam, D. (2000). Health literacy as a public health goal: A challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, 15(3), 259-267. doi:10.1093/heapro/15.3.259
- Osborn, C.Y., Weiss, B.D., Davis, T.C., Skripkauskas, S., Rodrigue, C., Bass, P.F., et al. (2007). Measuring adult literacy in health care: Performance of the newest vital sign. *American Journal of Health Behavior*, 31(Supplement 3), S36-S46. Retrieved from EBSCOHost Health Source: Nursing/Academic Edition database.
- Osterlind, S.J. (1998). *Constructing test items: Multiple-choice, constructed-response, performance, and other formats*. Boston, MA: Kluwer Academic Publishers.
- Osterlind, S.J. (2006). *Modern measurement: Theory, principles, and applications of mental appraisal*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Paasche-Orlow, M.K., Parker, R.M., Gazmararian, J.A., Nielson-Bohlman, L.T., & Rudd, R.R. (2004). The prevalence of limited health literacy. *Journal of General Internal Medicine*, 20, 175-184. doi:10.1111/j.1525-1497.2005.40245.x
- Paasche-Orlow, M.K., Riekert, K.A., Bilderback, A., Chanmugam, A., Hill, P., Rand, C.S., et al. (2005). Tailored education may reduce health literacy disparities in asthma self-management. *American Journal of Respiratory Critical Care Medicine*, 172, 980-986. doi:10.1164/rccm.200409-1291OC
- Parker, R. (2000). Health literacy: A challenge for American patients and their health care providers. *Health Promotion International*, 15(4), 277-283. doi:10.1093/heapro/15.4.277
- Parikh, N.S., Parker, R.M., Nurss, J.R., Baker, D.W., & Williams, M.V. (1996). Shame and health literacy: The unspoken connection. *Patient Education and Counseling*, 27(1), 33-39. doi:10.1016/0738-3991(95)00787-3
- Partnership for Clear Health Communication. (n.d.). Retrieved August 1, 2005 from <http://www.askme3.org/PFCHC/>.
- Persell, S.D., Osborn, C.Y., Richard, R., Skripkauskas, S., & Wolf, M.S. (2007). Limited health literacy is a barrier to medication reconciliation in ambulatory care. *Journal of General Internal Medicine*, 22(11), 1523-1526. doi:10.1007/s11606-007-0334-x.
- Pfizer, Inc. (2003). Clear Health Communication Initiative. Retrieved August 1, 2005 from <http://www.pfizerhealthliteracy.com>.

- Pignone, M., DeWalt, D.A., Sheridan, S., Berkman, N., & Lohr, K.N. (2005). Interventions to improve health outcomes for patients with low literacy: A systematic review. *Journal of General Internal Medicine*, 20, 185-192. doi:10.1111/j.1525-1497.2005.40208.x.
- Powell, C.K. & Kripalani, S. (2005). Brief Report: Resident recognition of low literacy as a risk factor in hospital readmission. *Journal of General Internal Medicine*, 20, 1042-1044. doi:10.1111/j.1525-1497.2005.0220.x
- Proceedings of the Surgeon General's Workshop on Improving Health Literacy. (2006, September). National Institutes of Health, Bethesda, MD. Retrieved on August 1, 2008 from <http://www.surgeongeneral.gov/topics/healthliteracy/toc.htm>.
- Pyrzczak, F. & Bruce, R.R. (2005). *Writing empirical research reports: A basic guide for students of the social and behavioral sciences*. 5th ed. Glendale, CA: Pyrczak Publishing.
- Ratzen, S. & Parker, R. (2000). Introduction. In *National Library of Medicine Current Bibliographies in Medicine: Health Literacy*. Selden, C.R., Zorn, M., Ratzan, S.C., & Parker, R.M. (Eds), NLM Pub. No. CBM 2000-1. Bethesda, MD: National Institutes of Health, United States Department of Health & Human Services.
- Roman, S. (2004). Illiteracy and older adults: Individual and societal implications. *Educational Gerontology*, 30, 79-93.
- Rothman, R.L., Housman, R., Weiss, H., Davis, D., Gregory, R., Gebretsadik, T., et al. (2006). Patient understanding of food labels: The role of literacy and numeracy. *American Journal of Preventive Medicine*, 31(5), 391-398. doi:10.1016/j.amepre.2006.07.025
- Safeer, R. & Keenan, J. (2005). Health literacy: The gap between physicians and patients. *American Family Physician*, 72, 463-468.
- Schumacker, R.E. & Lomax, R.G. (2004). *A beginner's guide to structural equation modeling*. 2nd ed. Mahwah, NJ: Lawrence Erlbaum
- Schwartzberg, J.G., VanGeest, J., Wang, C.C. (Eds.). (2005). *Understanding health literacy: Implications for medicine and public health*. American Medical Association.
- Schwartzberg, J.G., Cowett, A., VanGeest, J., & Wolf, M.S. (2007). Communication techniques for patients with low health literacy: A survey of physicians, nurses, and pharmacists. *American Journal of Health Behavior*, 31(Supplement 1), S96-S104. Retrieved from EBSCOHost Health Source: Nursing/Academic Edition database.

- Scott, T.L., Gazmararian, J.A., Williams, M.V., & Baker, D.W. (2002). Health literacy and preventive health care use among Medicare enrollees in a managed care organization. *Medical Care*, 40(5), 395-404. doi:10.1097/00005650-200205000-00005
- Seligman, H.K., Wallace, A.S., DeWalt, D.A., Schillinger, D., Arnold, C.L., Shilliday, B.B., et al. (2007). Facilitating behavior change with low-literacy patient education materials. *American Journal of Health Behavior*, 31(Supplement 1), S69-S78. Retrieved from EBSCOHost Health Source: Nursing/Academic Edition database.
- Schillinger, D., Piette, J., Grumbach, K., Wang, F., Wilson, C., Daher, C., et al. (2003). Closing the loop: Physician communication with diabetic patients who have low health literacy. *Archives of Internal Medicine*, 163, 83-90. doi:10.1001/archinte.163.1.83
- Siedow, M.D. (1998). Literacy in North Carolina. NC Literacy Resource Center. Retrieved on December 1, 2008 from http://www.ncccs.cc.nc.us/basic_skills/docs/pdf_documents/LitNCApril2002.PDF.
- Stevens, A.B., McDaniel, K.S., Glover, E.D. & Wallace, L.S. (2007). Are instructions for over-the-counter nicotine replacement therapy products readable? *American Journal of Health Behaviors*, 31(Supplement 1), S79-S84. Retrieved from EBSCOHost Health Source: Nursing/Academic Edition database.
- Storer, A. (2006). Bright lights, big ideas: Highlights from the 2006 AARC convention. *Therapy Times* [online journal]. Retrieved on January 30, 2007 from <http://www.therapytimes.com/AARC2006>.
- Sudore, R.L., Mehta, K.M., Simonsick, E.M., Harris, T.B., Newman, A.B., Satterfield, S., et al. (2006). Limited literacy in older people and disparities in health and healthcare access. *Journal of the American Geriatric Society*, 54, 770-776. doi:10.1111/j.1532-5415.2006.00691.x
- Sudore, R.L., Yaffe, K., Satterfield, S., Harris, T.B., Mehta, K.M., Simonsick, E.M., et al. (2006). Limited literacy and mortality in the elderly. *Journal of General Internal Medicine*, 21(8), 806-812.
- Tabachnick, B.G. & Fidell, L.S. (2007). *Using multivariate statistics*. 5th ed. Boston, MA: Allyn and Bacon.
- Truluck, J., & Courtenay, B. (1999). Learning style preferences among older adults. *Educational Gerontology*, 25, 221-236.

- Van Wynen, E. (2001). Key to successful aging: Learning-style patterns of older adults. *Journal of Gerontological Nursing*, 27 (9), 6-15.
- Vernon, J.A., Trujillo, A., Rosenbaum, S., & DeBuono, B. (2007). Low health literacy: Implications for national health policy. Retrieved on December 2, 2008 from http://npsf.org/askme3/pdfs/Case_Report_10_07.pdf.
- Wallace, L., Rogers, E., Roskos, S., Holiday, D., & Weiss, B. (2006). Brief report: Screening items to identify patients with limited health literacy skill. *Journal of General Internal Medicine*, 21, 874-877.
- Walsh, T.M. & Volsko, T.A. (2008). Readability assessment of Internet-based consumer health information. *Respiratory Care*, 53(10), 1310-1315.
- Weiss, B.D. (2007). *Health literacy and patient safety: Help patient understand. Manual for clinicians*. 2nd ed. American Medical Association Foundation. Retrieved from <http://www.ama-assn.org/ama1/pub/upload/mm/367/healthlitclinicians.pdf>.]
- Weiss, B., Mays, M., Martz, W., Castro, K., DeWalt, D., Pignone, M., et al. (2005). Quick assessment of literacy in primary care: The newest vital sign. *Annals of Family Medicine*, 3, 514-522.
- Weiss, B.D. & Palmer, R. (2004). Relationship between health care costs and very low literacy skills in a medically needy and indigent Medicaid population. *Journal of the American Board of Family Practice*, 17(1), 44-47.
- White, S., Chen, J., & Atchison, R. (2008). Relationship of preventive health practices and health literacy. A national study. *American Journal of Behavioral Health*, 32(3), 227-242. Retrieved from EBSCOHost Health Source: Nursing/Academic Edition database.
- Williams, M., Parker, R., Baker, D., Parikh, N., Pitkin, K., Coates, W., et al. (1995). Inadequate functional health literacy among patients at two public hospitals. *Journal of the American Medical Association*, 274, 1677-1682.
- Williams, M.V., Baker, D.W., Honig, E.G., & Nowlan, A. (1998). Inadequate literacy is a barrier to asthma knowledge and self-care. *Chest*, 114, 1008-1115. doi:10.1378/chest.114.4.1008
- Williams, M.V., Baker, D.W., Parker, R.M., & Nurss, J. (1998). Relationship of functional health literacy to patients' knowledge of their chronic disease: A study of patients with hypertension and diabetes. *Archives of Internal Medicine*, 158, 166-172. doi:10.1001/archinte.158.2.166
- Winslow, E. (2001). Patient education materials: Can patients read them, or are they ending up in the trash? *American Journal of Nursing*, 101 (10), 33-38

Wolf, M.S., Gazmararian, J.A., & Baker, D.W. (2005). Health literacy and functional health status among older adults. *Archives of Internal Medicine*, 165, 1946-1952. doi:10.1001/archinte.165.17.1946

APPENDIX A: NCRCB PERMISSION LETTER



NORTH CAROLINA RESPIRATORY CARE BOARD
1100 Navaho Drive, Suite 242
Raleigh, NC 27609

January 12, 2009

Kimberly Clark, MBA, RRT-NPS
Respiratory Therapy Program Director
Department of Kinesiology
University of North Carolina Charlotte
9201 University City Boulevard
Charlotte, NC 28223

Dear Ms Clark,

This letter will serve as permission from the NC Respiratory Care Board to utilize the Board's licensee database for the purpose of contacting licensees to assist in your efforts in conducting a research study on "Health Literacy: The Current State of Practice of Respiratory Therapists", for your dissertation as partial fulfillment of your doctoral degree at UNC Charlotte.

I understand the primary means of contact will be through email (Web-based survey) and US postal mail for those without an email address. I further understand that you will keep the information under strict confidence and stored on a password protected computer not to be shared with anyone or used for any other purpose.

Sincerely,

A handwritten signature in cursive script, reading "Floyd E. Boyer".

Floyd E. Boyer, RRT, RCP
Executive Director

1100 Navaho Drive
Suite 242
Raleigh, NC 27609
(919) 878-5595
FAX (919) 878-5565
Email: fboyer@ncrcb.org

APPENDIX B: HL-KES PERMISSION CORRESPONDENCE

Clark, Kim

From: ccormier@selu.edu
Sent: Wednesday, October 22, 2008 8:36 AM
To: Clark, Kim
Subject: re: Health Literacy Dissertation

Kim so glad to here that you are interested in the topic of health literacy. Right now I am away from work, my Mom fell and fractured her hip and I had to fly out to assist with surgery and rehab. You should be able to download the instrument on-line if you access dissertations through your library. If not when I get back to work on Monday I can send you the file.

I would be happy to collaborate with you on this project and future publications. Two nurses working on dissertations have made the same request and believe it or not a nurse in Thailand has emailed me and is replicating the study in her country. Stay in touch.

Cathy

On Tuesday, October 21, 2008 2:24 PM, Clark, Kim wrote:

>
 >Date: Tue, 21 Oct 2008 15:24:03 -0400
 >From: Clark, Kim
 >To: <ccormier@selu.edu>
 >cc:
 >Subject: Health Literacy Dissertation
 >
 >Dear Dr. Cormier,
 >
 >
 >
 >I am a doctoral candidate in the educational leadership program at UNC
 >Charlotte and I am in the process of writing my dissertation. My topic
 >is focused on the current state of practice in respiratory therapy in
 >addressing health literacy. Even though there are numerous studies on
 >health literacy, there is limited or should I say no research in my
 >professional field that I can find addressing the health literacy issue
 >beyond a few conference presentations and editorial type articles. My
 >goal is to create a greater awareness of the impact health literacy has
 >on patient care and develop professional educational opportunities in
 >our profession.
 >
 >
 >
 >I was excited to see your dissertation and that you developed a survey
 >instrument. Would it be possible to obtain a copy of the survey
 >instrument you developed for your dissertation? If I can obtain a
 >copy, would I have permission to modify it to respiratory therapy and
 >use it as a survey tool in my dissertation and any possible future
 >publication opportunities? Additionally, if you are interested, I
 >would be glad to share the results of my dissertation with you.
 >
 >
 >
 >I appreciate your time and consideration. I look forward to hearing
 >from you.
 >
 >

>
 >Best Regards,
 >
 >
 >
 >Kim
 >
 >Kimberly Clark, MBA, RRT-NPS
 >
 >Respiratory Therapy Program Director
 >
 >Department of Kinesiology
 >
 >University of North Carolina Charlotte
 >
 >9201 University City Boulevard
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 >kmclark1@uncc.edu <<mailto:kmclark1@uncc.edu>>
 >
 >

APPENDIX C: REVISED HL-KES INSTRUMENT

Revised Health Literacy Knowledge and Experience Survey

Introduction: Health literacy is the ability to obtain, process, and understand basic health information and services needed to make appropriate health decisions. The purpose of this study is to assess the health literacy knowledge and experience of respiratory therapists working in a variety of settings.

This survey consists of 45 questions that will generate a measure of health literacy knowledge and experience along with demographic information. Your participation in the survey will contribute to the body of knowledge on health literacy and provide valuable information to assist the efforts of those who develop educational programs and resources to address inadequate health literacy.

Your responses are strictly confidential and in no case will your responses be linked to your email address.

Part 1: Health Literacy Knowledge

Directions: Questions 1-26 are multiple-choice questions. Please read each question carefully and then choose the best answer. Choose only one response for each question.

1. Low health literacy levels are most prevalent among which of the following age groups?
 - 25-39 years of age
 - 40-49 years of age
 - 50-64 years of age
 - 65 years of age and older
2. Which of the following is the best predictor of health status?
 - Socioeconomic status
 - Health literacy
 - Gender
 - Educational level
3. What is the recommended reading grade level for written healthcare information?
 - 3rd – 4th grade
 - 5th – 6th grade
 - 8th – 9th grade
 - 10th – 12th grade
4. Patients with low health literacy experience which of the following?
 - Health status higher than those with adequate health literacy skills.
 - Fewer hospitalizations than those with adequate health literacy skills.
 - Lower health care costs than those with adequate health literacy skills.
 - Fewer treatment options than those with adequate health literacy skills.

5. Which of the following groups is low health literacy most prevalent?
 - African Americans
 - Hispanic Americans
 - White Americans
 - All Ethnic groups
6. What is the estimated number of American adults who have difficulty reading and understanding health information?
 - 750,000
 - 50 million
 - 90 million
 - 150 million
7. According to recent research, what percent of patients report forgetting what the doctor told them as soon as he or she has left the room?
 - 20%
 - 50%
 - 80%
 - 100%
8. Which of the following questions would provide the health care professional with the best estimate of reading skills of the patient?
 - “What is the last grade you completed in school?”
 - “Do you have difficulty reading?”
 - “Would you read the label on this medication bottle for me?”
 - “Do you need eye glasses to read?”
9. Approximately what percent of patients never told their healthcare providers about their low health literacy because they felt ashamed or embarrassed?
 - 25%
 - 52%
 - 68%
 - 89%
10. The research on health literacy indicates which of the following?
 - The last grade completed is an accurate reflection of an individual’s ability to read.
 - Most individuals read three to five grade levels lower than the last year of school completed.
 - If an individual has completed high school, he or she will be functionally literate.
 - If an individual has completed grammar school, he or she will be functionally literate.
11. How do many patients respond to experiencing difficulty understanding health information?
 - Readily share that they need assistance with written information.
 - Deny that they have difficulty understanding to avoid appearing stupid.
 - Frequently ask questions about information they do not understand.
 - Actively participate in decisions regarding their health care.

12. What is the strongest advantage of conducting health literacy screenings?
 - Provide healthcare professionals with a good estimate of the educational level of individuals.
 - Will help healthcare professionals provide effective patient education.
 - Can be used to diagnose learning difficulties that serve as barriers to patient teaching.
 - Assist healthcare agencies to comply with educational standards established by Joint Commission.
13. Which of the following health behaviors are common among patients with low health literacy skills?
 - A lack of participation in preventive healthcare.
 - An unwillingness to make lifestyle changes necessary to improve health
 - A disinterest in learning about healthcare problems.
 - An unwillingness to learn how to correctly take prescribed medications.
14. Which of the following approaches would be the most practical to ensure that patients with low health literacy receive understandable health information?
 - Ask all patients to complete the REALM at the start of the visit.
 - Communicate with all patients using simple language and avoid medical jargon.
 - Use models to supplement verbal instructions.
 - Follow up with all patients by calling to check for understanding.
15. Which of the following is true with regards to written healthcare information?
 - Most healthcare information is written at an appropriate reading level for patients.
 - Pictures illustrations can improve a patient's understanding of written information.
 - Patients are usually provided with information that they think is important to know about their healthcare status.
 - Patients typically comprehend written information better than verbal instructions.
16. When providing verbal information about asthma medication, how many concepts should be presented at a time?
 - 2 to 3 concepts
 - 4 to 6 concepts
 - 8 to 10 concepts
 - 12 to 15 concepts
17. Approximately what percent of patients with asthma who have low health literacy do not use their metered-dose inhaler correctly?
 - 10%
 - 48%
 - 88%
 - 96%
18. If a patient is unable to perform a proper inhaler technique following instruction, what should the healthcare professional do?
 - Tell the patient to follow the written instructions and practice at home.
 - Re-phrase the instructions and ask the patient to perform the inhaler technique again.
 - Recommend a different medication for the patient that is not an inhaler.
 - Send the patient home with a videotape on how to use the inhaler.

19. Which of the following should the healthcare professional consider when caring for patients with low health literacy levels? Patients with low health literacy...
- Can understand written healthcare information if they are able to read it.
 - Will not be able to learn about their healthcare needs.
 - Will have difficulty applying healthcare information to their health situation.
 - Have lower intelligence scores than average readers.
20. What is the best way to ensure that a smoking cessation brochure is culturally appropriate?
- Review the research on the community's culture.
 - Obtain input from healthcare professionals who have worked in the community.
 - Explore the types of materials currently available.
 - Include community members in the design of the brochure.
21. Which of the following would be considered the first step in developing written healthcare information?
- Outline the content.
 - List the learning objectives.
 - Identify what the audience needs to know.
 - Research the content area.
22. Written healthcare information provided to a patient related to a specific disease should include which of the following?
- Only two or three main ideas about the disease.
 - All treatment options available to manage the disease.
 - A detailed explanation of the pathophysiology of the disease.
 - Statistics on the incidence of the disease.
23. Which of the following approaches to patient education provides the most opportunity for the patient to actively engage in learning?
- Incorporate short answer questions periodically throughout the written healthcare materials.
 - Instructing the patient to watch a video after providing written materials.
 - Planning a question-answer session in small groups after completing a learning activity.
 - Providing pictures for the patient to circle in response to questions asked in a healthcare brochure.
24. What is the most effective way for the healthcare professional to determine how well a patient with low health literacy skills understands healthcare information?
- Use a pre-test before instruction and a post-test following instruction.
 - Ask the question, "Do you understand the information I just gave you?"
 - Have the patient teach back the information to the healthcare professional.
 - Verbally ask the patient a series of questions following instructions.

25. Which of the following would be the most effective approach to assess patient understanding of medical information?
- “I’ve given you a lot of information about asthma. Do you understand what I have told you?”
 - “I’ve given you a lot of information about asthma. I just want to be sure you that everything I told you is clear. Do you understand what I have told you?”
 - “I’ve given you a lot of information about asthma. You need to understand how important this information is. You follow my instructions exactly the way I explained. What do you understand?”
 - “I’ve given you a lot of information about asthma. Please tell me your understanding about your asthma and its treatment.”
26. What is the minimum time required to assess your patient’s health literacy?
- 1 minute or less
 - 5 minutes
 - 8 minutes
 - 15 minutes or more

Questions 27-28 involve reading and critiquing brief excerpts from patient education brochures. Please read the following patient education brochure excerpts and answer the corresponding questions to each.

What Is COPD?

There are two major diseases included in COPD, *chronic bronchitis* and *emphysema*. In both, narrowed *bronchi* (see figure on page 3) make it hard to exhale. Narrowed bronchi also cause asthma—but in asthma, the narrowing is temporary and reversible. In COPD, it’s permanent and only partially reversible.

In chronic bronchitis, an enlargement of the mucous glands and excessive mucus production contribute to the narrowing. In emphysema, the narrowing comes from damage to the bronchi themselves and is more severe. *Inflammation* triggered by inhaled irritants also contributes to COPD. White blood cells respond to the irritation, but instead of controlling the problem, they can release chemicals that, if unchecked, damage and eventually destroy lung tissue.

27. Given the above patient education materials for “What is COPD?” please select from the following that best describe this brochure excerpt. (check all that apply)

- ☐ Written at or below 6th grade reading level
- ☐ Short and simple sentence structure
- ☐ Frequent use of technical/medical words
- ☐ Large font with serifs (e.g. Times New Roman)
- ☐ Bulleted lists to draw attention to key concepts
- ☐ Frequent use of words with 3 or more syllables
- ☐ Short paragraphs

Signs and symptoms of COPD

People with COPD usually have some of these symptoms:

- *feeling short of breath*
- *feeling tired*
- *coughing, and coughing up phlegm (mucus)*
- *wheezing*
- *getting lung infections at lot (the flu, pneumonia– it usually takes you longer than most people to get better after a cold)*
- *losing weight without trying*

COPD is the kind of disease that sneaks up on you. It might start with a cough that doesn't go away. Or maybe you notice you're short of breath when you walk up the stairs.

People might think that feeling short of breath is a normal sign of aging but it's not. If you have these signs and symptoms, see your doctor. Ask for spirometry, a simple test that measures how much air you move out of your lungs.

28. Given the above patient education materials for “Signs and Symptoms COPD?” please select from the following that best describe this brochure excerpt. (check all that apply)

- ☐ Written at or below 6th grade reading level
- ☐ Short and simple sentence structure
- ☐ Frequent use of technical/medical words
- ☐ Large font with serifs (e.g. Times New Roman)
- ☐ Bulleted lists to draw attention to key concepts
- ☐ Frequent use of words with 3 or more syllables
- ☐ Short paragraphs

Part 2: Health Literacy Experience

Directions: Questions 29-38 ask you to describe your experience related to the evaluation and presentation of patient information. Please read each question carefully and then choose the response that best describes your health literacy experiences.

29. How often was health literacy emphasized in your respiratory therapy education program?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always
30. How often do you use a health literacy screening tool to assess the health literacy skills of a patient?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always
31. How often do you evaluate the reading level of written healthcare materials before using them for patient teaching?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always
32. How often do you evaluate the cultural appropriateness of healthcare materials, including written handouts, videos, and audiotapes, before using them for patient teaching?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always
33. How often do you evaluate the use of illustrations in written healthcare materials before using them for patient teaching?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always
34. How often do you use written materials to provide healthcare information to an individual or community group?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always
35. How often do you use audiotapes to provide healthcare information to an individual or community group?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always

36. How often do you use videotapes to provide healthcare information to an individual or community group?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always
37. How often do you use computer software (e.g. PowerPoint or interactive CD-ROMs) to provide healthcare information to an individual or community group?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always
38. How often do you use internet resources, such as www.askme3.org and www.healthliteracy.com, to obtain health literacy information?
- ☐ Never
 - ☐ Sometimes
 - ☐ Frequently
 - ☐ Always

Part 3: Demographic Data

Please choose the response that characterizes you best. This information will be very helpful to us. **Your responses are strictly confidential.**

39. Gender
- ☐ Male
 - ☐ Female
40. Please enter your age in years
-
41. Education Level (select one)
- ☐ Certificate/Diploma
 - ☐ Associates Degree
 - ☐ Bachelor's Degree
 - ☐ Master's Degree
 - ☐ Doctoral Degree
42. Credentials (select one)
- ☐ CRT
 - ☐ RRT
 - ☐ CRT/Specialty Credential
 - ☐ RRT/Specialty Credential

43. Please select your years of respiratory therapy experience
- ☐ < 1 year
 - ☐ 1-5 years
 - ☐ 6-10 years
 - ☐ 11-20 years
 - ☐ >20 years
44. Primary practice area (select one)
- ☐ Adult acute/critical care
 - ☐ Neonatal-Pediatric acute/critical care
 - ☐ Long-term care facility
 - ☐ Rehabilitation facility
 - ☐ Home Care/DME
 - ☐ Management/education/research
45. Please indicate the region of North Carolina you work (select only one)
- ☐ West
 - ☐ Northwest
 - ☐ Central
 - ☐ Northeast
 - ☐ Southeast

When you submit your responses, you will be redirected to a website that will provide the correct responses to the Part 1: Knowledge section, additional health literacy resources, and give you the chance to enter a drawing to win one of three iPod Shuffles. You will be asked to enter your name and email address. Your contact information will be kept confidential and cannot be linked to this survey or your responses. Participation in the drawing is voluntary. Thank you for your participation. Your responses are greatly appreciated.

APPENDIX D: ORIGINAL HL-KES INSTRUMENT

Original Health Literacy Knowledge and Experience Survey

Introduction: Health literacy is the ability to read, understand and make informed decisions about health care. The purpose of this study is to assess the health literacy knowledge and experiences of senior level baccalaureate nursing students enrolled at state universities in Louisiana.

Your participation in the survey will contribute to the body of knowledge on health literacy and provide valuable information to nursing faculty responsible for developing a nursing curriculum that prepares nursing students with the skills needed to provide healthcare to individuals with low health literacy skills.

Your responses will be kept anonymous and in no way affect your grade in any nursing course. I encourage you to participate in this research study; however, participation is optional for all students. Informed consent is implied with completion of the survey.

Part 1: Health Literacy Knowledge

Directions: Questions 1-29 are multiple-choice questions. Choose the best answer and record only one response for each question.

1. Low health literacy levels are most prevalent among which of the following age groups?
 - 16 to 24 years of age
 - 25 to 34 years of age
 - 35 to 44 years of age
 - 45 to 54 years of age
 - 65 years of age and older
2. Low health literacy levels are common among:
 - African Americans
 - Hispanic Americans
 - White Americans
 - All Ethnic groups
3. The research on health literacy indicates that:
 - the last grade completed is an accurate reflection of an individual's ability to read.
 - most individuals read three to five grade levels lower than the last year of school completed.
 - if an individual has completed high school, they will be functionally literate.
 - if an individual has completed grammar school, they will be functionally literate.
4. What is the likelihood that a nurse working in a public health clinic, primarily serving low-income minorities, will encounter a patient with low health literacy skills?
 - almost never
 - occasionally
 - often
 - very often

5. The best predictor of healthcare status is:
 - socioeconomic status
 - literacy
 - gender
 - educational level
6. Patients with low health literacy skills:
 - rate their Health status higher than those with adequate health literacy skills.
 - experience fewer hospitalizations than those with adequate health literacy skills.
 - are often prescribed less complicated medication regimens than those with adequate health literacy skills.
 - are often diagnosed late and have fewer treatment options than those with adequate health literacy skills.
7. Health behaviors are common among patients with low health literacy skills include:
 - lack of participation in preventive healthcare.
 - disinterest in learning about healthcare problems.
 - an unwillingness to make lifestyle changes necessary to improve health.
 - the inability to learn how to correctly take prescribed medications.
8. Patients cope with low health literacy skills by:
 - asking multiple questions about healthcare instructions that they do not understand.
 - exploring treatment options before signing surgical consent forms.
 - relying heavily on written healthcare instructions.
 - pretending to read information given to them by healthcare providers.
9. The nurse should keep in mind that individuals with low health literacy levels:
 - can understand written healthcare information if they are able to read it.
 - will not be able to learn about their healthcare needs.
 - have lower intelligence scores than average readers.
 - will have difficulty applying healthcare information to their health situation.
10. The Rapid Estimate of Adult Health Literacy in Medicine is an instrument utilized to:
 - determine the reading level of written healthcare information.
 - assess the math skills of an individual required for medication administration.
 - evaluate the overall quality of written health care information
 - assess the ability of an individual to read common medical terms.
11. When working with individuals who have low health literacy skills the nurse should keep in mind that these individuals:
 - may not admit that they have difficulty reading.
 - will readily share that they need assistance with written information.
 - will frequently ask questions about information they do not understand.
 - should not be expected to manage their healthcare since they cannot read.
12. Which of the following questions would provide the nurse with the best estimate of reading skills of the patient?
 - “What is the last grade you completed in school?”
 - “Do you have difficulty reading?”
 - “Would you read the label on this medication bottle for me?”
 - “Do you need eye glasses to read?”

13. What statement best describes the Test of Functional Health Literacy? This instrument is:
- used to assess the reading comprehension and numerical skills of an individual.
 - only available in English and therefore has limited use with immigrants.
 - an effective tool for assessing the reading level of individuals.
 - recommended for determining the reading level of written healthcare materials.
14. What is the strongest advantage of conducting health literacy screenings? Health literacy screenings:
- provide nurses with a good estimate of the educational level of individuals.
 - will help nurses to be more effective when providing healthcare teaching.
 - can be used to diagnose learning difficulties that serve as barriers to patient teaching.
 - assist healthcare agencies to comply with educational standards established by the Joint Commission on Accreditation on Health Organizations.
15. Which of the following statements, made by the nurse, would be the best approach to initiating a health literacy screening with a patient?
- “It is necessary for me to assess your reading level; this will take a few minutes, and it is very important.”
 - “I need to conduct a test to see if you can read. Please read these words for me.”
 - “I want to make sure that I explain things in a way that is easy for you to understand. Will you help me by reading some words for me?”
 - “I need to administer a reading test to you. If you cooperate this will not take long.”
16. After providing written healthcare information to a patient he states, “Let me take this information home to read.” This may be a clue to the nurse that the patient:
- is in a hurry and does not have time for instruction.
 - is not interested in learning the information.
 - is noncompliant with healthcare treatments.
 - may not be able to read the materials.
17. An individual with functional health literacy will be able to:
- follow verbal instructions but not written healthcare instructions.
 - read healthcare information but have difficulty managing basic healthcare needs.
 - read and comprehend healthcare information.
 - read, comprehend, and actively participate in decisions concerning healthcare.
18. Which of the following is true with regards to written healthcare information?
- Most healthcare information is written at an appropriate reading level for patients.
 - Illustrations can improve a patient’s understanding of written information.
 - Patients are usually provided with information that they think is important to know about their healthcare status.
 - Overall patients comprehend written information better than verbal instructions.
19. The recommended reading level for written healthcare information is:
- 5th grade
 - 8th grade
 - 10th grade
 - 12th grade

20. The first step in developing written healthcare information is to:
- outline the content.
 - list the learning objectives.
 - find what the audience needs to know.
 - research the content area.
21. Which of the following statements best describe the Fry Method?
- This formula is used to calculate word difficulty in a written document.
 - This method calculates the readability level of a written document by counting the selecting syllables and sentences within a document.
 - It is an effective tool used for measuring who well a patient understands healthcare information.
 - This instrument is used to evaluate the cultural appropriateness of written healthcare instructions.
22. Recommendations for developing written healthcare materials include:
- using dark colored papers for printing.
 - presenting information in the form of a conversation.
 - including abbreviations when possible to save space.
 - printing words in fancy script.
23. When listing side effects for a handout on chemotherapy the oncology nurse should limit the list to:
- 2-3 items.
 - 5-6 items.
 - 10-12 items.
 - 15-20 items.
24. Written healthcare information provided to a patient related to a specific disease should include:
- only three or four main ideas about the disease.
 - all treatment options available to manage the disease.
 - a detailed explanation of the pathophysiology of the disease.
 - statistics on the incidence of the disease.
25. Which of the following would be the most effective wording for a heading in a brochure on hypertension?
- HYPERTENSION: THE SILENT KILLER
 - Symptoms of high blood pressure
 - How do I know that I have high blood pressure?
 - What factors contribute to hypertension?
26. The best way to ensure that a breast cancer prevention brochure is culturally appropriate is to:
- review the research on the community's culture.
 - obtain input from nurses who have worked in the community.
 - explore the types of materials currently available.
 - include community members in the design of the brochure.

27. Which of the following instructions on the management of diabetes would be best understood by an individual with low health literacy skills?
- Check your blood sugar every morning.
 - Insulin should be taken as directed by your physician.
 - Diabetes is a disease of energy metabolism.
 - Complications associated with insulin include hypoglycemic reactions.
28. Which of the following approaches to patient education provides minimal opportunity for the patient to actively engage in learning?
- Incorporating short answer questions periodically throughout the written healthcare materials and providing space for the patient to write responses.
 - Instructing the patient to watch a video after providing written materials.
 - Planning a question answer session in small groups after completing a learning activity.
 - Providing pictures for the patient to circle in response to questions asked in a healthcare brochure.
29. The most effective way for the nurse to determine how well a patient with low health literacy skills understands healthcare information is to:
- utilize a pre-test before instruction and a post-test following instruction.
 - ask the question, “Do you understand the information I just gave you?”
 - have the patient teach back the information to the nurse.
 - verbally ask the patient a series of questions following instructions.

Part 2: Health Literacy Experiences

Directions: Questions 30-38 ask you to describe how often you participate in learning activities related to health literacy. Choose the response that best describes health literacy experiences while enrolled in nursing school.

	Never	Sometimes	Frequently	Always
30. How frequently was health literacy emphasized in your nursing curriculum?	1	2	3	4
31. How often did you use a health literacy screening tool to assess the health literacy skills of an individual?	1	2	3	4
32. How often did you evaluate the reading level of written healthcare materials before using them for patient teaching?	1	2	3	4
33. How often did you evaluate the cultural appropriateness of healthcare materials, including written handouts, videos, and audiotapes, before using them for patient teaching?	1	2	3	4

	Never	Sometimes	Frequently	Always
34. How often did you evaluate the use of illustrations in written healthcare materials before using them for patient teaching?	1	2	3	4
35. How often did you use written materials to provide healthcare information to an individual or community group?	1	2	3	4
36. How often did you use audiotapes to provide healthcare information to an individual or community group?	1	2	3	4
37. How often did you use videotapes to provide healthcare information to an individual or community group?	1	2	3	4
38. How often did you use computer software to provide healthcare information to an individual or community group?	1	2	3	4

Part 3: Demographic Data

Directions: Questions 39-45 relate to demographic data. Choose the response that characterizes you best.

39. Gender

- ☐ Male
- ☐ Female

40. Ethnicity

- ☐ White
- ☐ African American
- ☐ Other

41. Prior educational experience:

- ☐ No prior degrees
- ☐ At least an undergraduate degree before entering nursing school
- ☐ At least a master's degree before entering nursing

42. I am certified in some other area of healthcare. (nursing assistant, radiology technician, emergency medical technician, licensed practical nurse)

- ☐ No
- ☐ Yes

43. How frequently do you interact with healthcare providers for your own personal health care needs or the healthcare needs of a significant other?

- ☐ Every few years
- ☐ At least once a year
- ☐ Three to four times a year

44. Please enter your age in years


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45. Please enter your grade point average in required nursing courses at the beginning of this semester.

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Thank you for completing this survey. Please place your survey in the box provided in the front of the room.

APPENDIX E: IRB APPROVAL DOCUMENTATION



UNC CHARLOTTE

Compliance Office / Office of Research Services

9201 University City Blvd, Charlotte, NC 28223-0001
t/ 704.687.3311 f/ 704.687.2292 www.research.uncc.edu/comp/complian.cfm

Institutional Review Board (IRB) for Research with Human Subjects

Approval of Exemption


Protocol #	09-03-37		
Title:	Health Literacy: The Current State of Practice Among Respiratory Therapists		
Date:	3/23/2009		
Student Investigator	Ms. Kimberly	Clark	Kinesiology
Responsible Faculty	Dr. Claudia	Flowers	Educational Leadership

The Institutional Review Board (IRB) certifies that the protocol listed above is exempt under category 2 .

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:

- a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
- b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Please note that it is the investigator's responsibility to promptly inform the committee of any changes in the proposed research, as well as any unanticipated problems that may arise involving risks to subjects. Amendment and Event Reporting forms are available on our web site: <http://www.research.uncc.edu/comp/human.cfm>



3-26-09

Date

Dr. M. Lyn Exum, IRB Chair

The UNIVERSITY of NORTH CAROLINA at CHARLOTTE

An Equal Opportunity/Affirmative Action Employer

APPENDIX F: SURVEY INVITATION EMAIL

To: [participant email address]
Cc:
Bcc:
Re: UNC Charlotte Health Literacy Dissertation Research Project

Dear: Mr/s [last name],

In partial fulfillment of my doctoral degree at the University of North Carolina at Charlotte, I am required to complete a research study to satisfy the requirements for dissertation. My study involves assessing the health literacy knowledge and experiences among respiratory therapists working in a variety of settings. The research is being supervised by Dr. Claudia Flowers from the College of Education.

Your participation in this survey will contribute to the body of knowledge on health literacy and provide valuable information to assist the efforts of those responsible for developing educational programs and resources to address inadequate health literacy.

You will be asked to read an informed consent document prior to the survey. If you agree to participate, you will be directed toward the survey items. Participation in the survey typically takes approximately 15-20 minutes. Submission of the completed survey implies your informed consent. Your responses will be kept confidential and in no case will your responses be linked to your email address. In addition, you will be eligible for a drawing to win one of three iPod Shuffles.

If you have any questions about this study, please do not hesitate to contact me at 704-687-3379 or by email at kmclark1@uncc.edu.

Thank you for your time and consideration.

You may access the survey at the link below:

<http://www.surveymshare.com/survey/take/?sid=84174>

APPENDIX G: INFORMED CONSENT

Health Literacy Knowledge and Experience Assessment

Informed Consent

Purpose: The purpose of this research study is to assess health literacy knowledge and experience among respiratory therapists in a variety of settings. Your participation in the survey will contribute to the body of knowledge on health literacy and provide valuable information to assist the efforts of those responsible for developing educational programs and resources to address inadequate health literacy. This study is being conducted by Ms. Kimberly Clark as partial fulfillment of the requirements for the doctorate in educational leadership, and it has been approved by the University of North Carolina at Charlotte Institutional Review Board.

Inclusion Criteria: All NCRCB licensed respiratory therapists are invited to participate in this study.

If you choose to participate in this study, you will be asked to complete an online survey with items assessing your knowledge and experience related to health literacy and demographic information. Participation in the survey typically takes approximately 15-20 minutes.

Benefits/Risks: There is no cost associated with participating in this survey. You will be invited to enter a drawing to win one of three iPod Shuffles on completion of the survey. No deception is involved, and the study involves no foreseeable direct risks associated with your participation in this study.

Volunteer Statement: Your participation is entirely voluntary and you may withdraw at any time without penalty. Participation or withdrawal involves no penalty or loss of benefits to which you are otherwise entitled.

Confidentiality Statement: All survey responses are anonymous and confidential and will be stored in a secure location with access limited to the project investigators. In no case will your responses be identified or linked to your email address. Rather, all data will be pooled and published in aggregate form only.

It is important that you are treated in a fair and respectful manner. Please contact the University's Research Compliance Office (704-687-3309) if you have questions or concerns about your rights as a participant in this study. If you have questions concerning the study, please contact Kimberly Clark at (704) 687-3379 or by email at KMCLARK1@uncc.edu.

By selecting the "Continue" button below, I confirm that I am at least 18 years of age and have carefully reviewed this consent form. The submission of my completed survey implies consent to participate in this study. I have been informed that I may contact the researcher at the number or email address provided if I have any questions before, during, or after my completion of this survey.

APPENDIX H: SELECTED HEALTH LITERACY RESOURCES AND EDUCATIONAL PROGRAMS

Online Resources:

1. American College of Physicians Health Literacy Resources
<http://foundation.acponline.org/hl/hlresources.htm>
2. American Medical Association Foundation Health Literacy Initiative
<http://www.amafoundation.org/go/healthliteracy>
3. Ask-Me-3 <http://www.npsf.org/askme3/>
4. Is Our Pharmacy Meeting Patients' Needs? A Pharmacy Health Literacy Assessment Tool User's Guide
<http://www.ahrq.gov/qual/pharmlit/>
5. Medscape CME <http://cme.medscape.com/medscapetoday>
6. National Institute for Literacy <http://www.nifl.gov>
7. National Patient Safety Foundation (Partnership for Clear Health Communication)
<http://www.npsf.org/pchc2/>
8. Pfizer Clear Health Communication Initiative
<http://www.pfizerhealthliteracy.com/>
9. Reach Out and Read <http://www.reachoutandread.org/>
10. Strategies to Improve Comm Between Pharmacy Staff and Pts: A Training Program for Pharmacy Staff
<http://www.ahrq.gov/qual/pharmlit/pharmtrain.htm>
11. US Dept of Health & Human Services. Unified Health Communication 101: Addressing Health Literacy, Cultural Competency, and Limited English Proficiency <http://www.hrsa.gov/healthliteracy/training.htm>

Educational Programs:

1. Harvard School of Public Health: Health Literacy Studies
<http://www.hsph.harvard.edu/healthliteracy>
2. Health Literacy Center University of New England, Biddeford, Maine
<http://www.une.edu/hlit>
3. Clear Language Group www.clearlanguagegroup.com
4. Health Literacy and the Older Adult (self-learning module) University of Arizona Reynolds Program in Applied Geriatrics
<http://healthlit.fcm.arizona.edu/>